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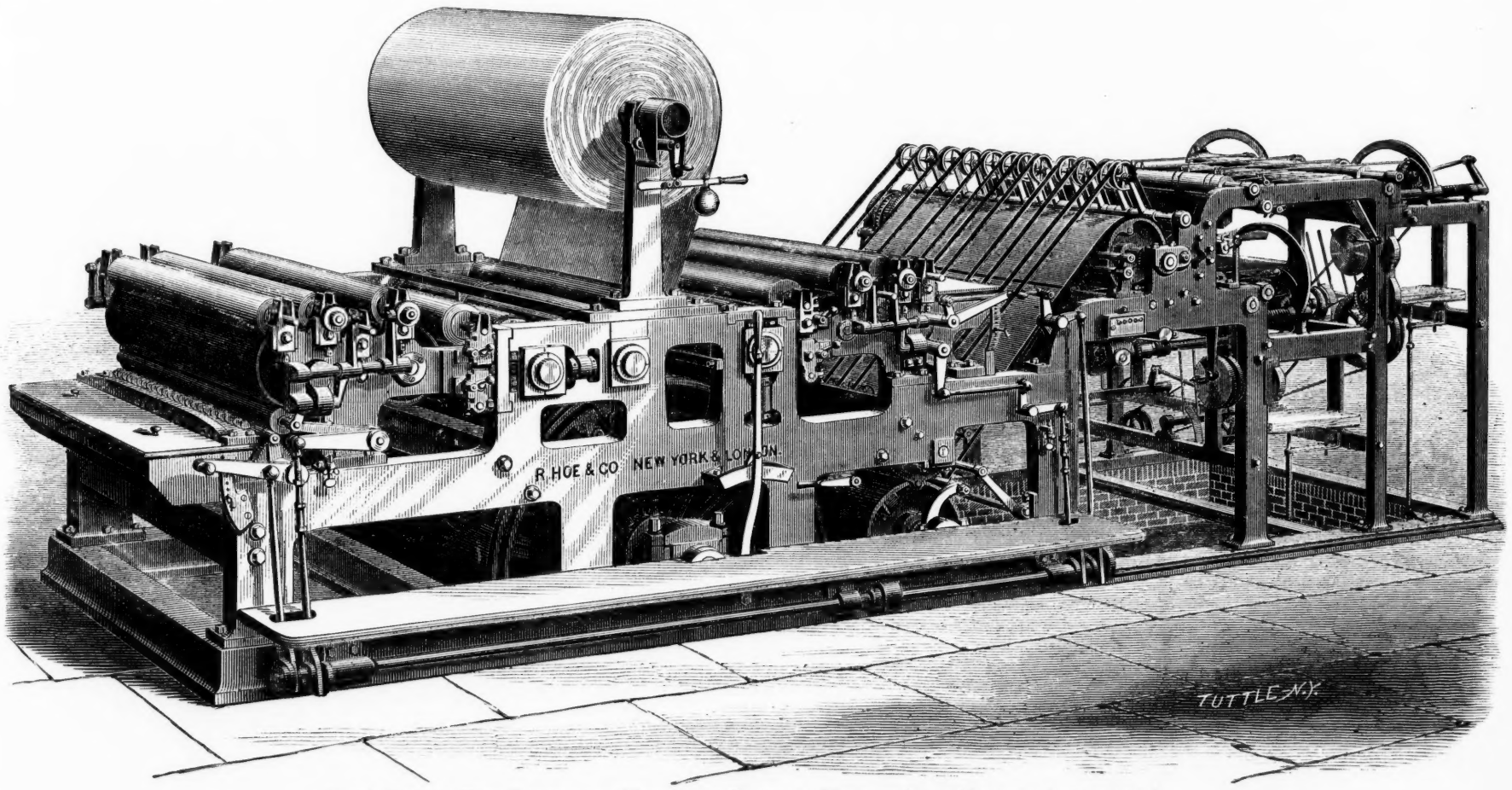
Hoe's Web Perfecting Newspaper Printing and Folding Machine.

Next to the steam engine, the machine that has contributed most to the world's material progress is the printing press. No other machine can compare with it in contributing to the enlightenment of mankind. From the rude and simple press upon which Dr. Franklin learned his trade, to the marvelous Hoe presses of the present day, the best talent and most consummate mechanical skill has been diligently employed in bringing the printing machine to its highest perfection. Several years ago it was believed that the very acme of rapidity and completeness had been attained, but later still more rapid and more complete printing presses were brought out and placed in operation. We have the pleasure of exhibiting, on this page, a view of the Hoe Double Web Perfecting Press and Folding Machine, which is believed to be the fastest and most perfect piece of printing mechanism in existence. Without entering into a history of the progress of printing presses (which the limits of our space forbid), we may take for comparison the capacities of the Hoe presses of different eras. The single cylinder Hoe press of 1843 printed 1,200 papers, on one side, per hour; the double cylinder Hoe press of 1853 printed 2,500 to 3,000 papers, on one side, per hour; the four cylinder Hoe press of 1858 printed 8,000 to 10,000 papers, on one side, per hour; the eight cylinder Hoe press of 1863 printed 16,000 to 22,000 papers, on one side, per hour; the Hoe double web perfecting press, shown on this page, prints, cuts, pastes and folds 30,000 *papers, on both sides, per hour!* The Bullock press of 1872 prints but 10,000 copies, on both sides, per hour, and the Walter press of 1872 prints but 17,000 to 20,000 papers, on both sides, per hour.

The following description, taken from a late issue of the *St. Louis Republican*, will convey some idea of the process of printing and folding an eight-page newspaper upon this wonderful press:

"Hoe's new perfecting and folding press is nine feet wide and twenty-five long, including the folding attachment. The highest part of the machine is the folder, which is seven feet six inches high. The principal portion of the press proper, however, is only four feet six inches, which brings it about breast high, so that its working is easily under the attendant's eye. The type and impression-cylinders are arranged in pairs, very nearly as in the ordinary perfecting press, with the important exception that there are double sets of stereotype plates, the whole paper being cast in duplicate. The roll of paper is hung near one end of the machine, and as the web unwinds, it first makes a half-turn around a roller of polished wood, which removes all wrinkles and creases, caused by the process of dampening the paper, and then passes between the first pair of type and impression cylinders. The type-cylinder contains the plates of eight pages, and they are arranged in a peculiar manner. Pages 4, 5, 2 and 7 are placed on one end of the first type-cylinder, the columns running around the cylinder, and around the other end are placed duplicate plates of the same pages. The paper, after receiving the impression of these pages, is carried to the second type-cylinder, to which are attached in the same way duplicate plates of the other four pages, and here the process of printing is completed by the impression of pages 3, 6, 1 and 8 on the reverse side. The second impression cylinder which revolves against these pages is covered with a blanket to absorb the "set-off," or transfer of ink from the freshly printed first side, and in order to distribute this transfer over a wide surface the cylinder is made of large size. Issuing from between these revolving pieces of mechanism the web of paper contains a double row of papers placed side to side, and the next process is to cut the sheets apart. Two transverse cuts are required to separate the pages from the roll, and a longitudinal cut to divide the duplicate halves of the portions thus clipped off. The first process is to make the transverse cuts. For this purpose the web is conducted to a third pair of cylinders, one of which is furnished with two cutting-blades running its whole length parallel with the axis, and playing into corresponding grooves in the other, and as the web passes, it is divided into half-sheets the width of two pages at each half revolution of the cylinder. Not wholly divided, however; the continuity of the web needs to be preserved for a fraction of a second longer, and two or three points of attachment are consequently left between the portions until they are fairly started on a series of tapes which lead to the collecting cylinder, before reaching which they are pasted alternately by a rotary pasting disc. Here the speed of travel is slightly increased, and the successive half-sheets break away from their companions and hurry forward. And now comes into play the most curious device in the apparatus. Suppose the velocity of the machine reduced, so that the course of each clipping separated from the web can be traced on its journey: The first piece to reach the collecting cylinder contains eight pages of the paper, indeed, but not the eight which make up a complete paper; on the upper surface are printed, side by side and occupying half the breadth of the web, pages 3 and 6; end to end with them, taking up the other half of the breadth, is a duplicate impression of the same two pages. On the other side are pages 4 and 5, likewise in duplicate. Now, when this section of the web arrives at the collector it is carried entirely around, making a single complete revolution while the next sheet cut from the web is traveling along to overtake it. This second piece contains duplicate impressions of the four missing pages 1 and 8 on the upper surface, 2 and 7 on the reverse, and the movement is so nicely timed that, as the forward edge of the first sheet comes up around the cylinder it exactly meets the forward edge of the newly-arrived second sheet at the top of the collector, whence they go on together, one overlying the other, and the two halves of the paper thus falling into their proper position. But when the two sheets laid together reach the point where the first sheet at the previous revolution had begun to wrap itself around the cylinder, there is now a change of route. A series of brass points, called switches, which play up and down between the tapes just over the top of the cylinder, rising at one revolution and falling at the next, lift up the advancing pair of sheets and lead them off to a set of tapes which carry them forward. Meanwhile, the same process is repeated in regular alternation with the sheets which follow close behind. Thus only every other sheet makes the revolution of the collecting cylinder, and the result of its digression from the direct path is, that it finds itself at the end of the round underneath the sheet which started next behind it, and which constitutes its complementary half. The next operation is



HOE'S PATENT WEB PERFECTING NEWSPAPER PRINTING MACHINE (WITH FOLDING ATTACHMENT).

FOLDING.

"The pair of sheets is no sooner clear of the collector than it is conducted to the top of the folder, and thence down an inclined plane under a roller, which separates the sheets by a rotary cutter and passes them on to a stop directly over the folding rollers. The sheet falling is run past the former or first inclined plane, conducted by a switch to a second inclined plane, which is an exact duplicate of the former, with the four sheets directly over the folding rollers.

"From this point in the machine four streams of papers rush onward. A stop-gauge checks their speed for an instant, and down upon each simultaneously falls a folding blade, placed at right angles to the axis of the cylinder, striking each exactly in the middle of the sheet, and sending the doubled papers between a second set of rollers which give it the first transverse fold. Two repetitions of the same process, by still other sets of blades and rollers, reduce the sheets to the proper form for mailing, and the *Republican's* issue, at the rate of 400 a minute, in two wooden troughs or boxes at the bottom of the press, every paper folded with mathematical precision, far more neatly than the most expert workman could have folded it by hand.

"This is the process of printing the mail edition, but the press will fold in any desired form. As soon as the mail edition is out of the way the preparation of the carriers' edition begins. The press is stopped for about one minute. The turn of a screw throws certain parts of the apparatus out of gear, and when the machine starts again the papers, after taking their first transverse fold across the page, are deposited by a small flyer on four tables arranged to fall as the size of the pile increases, two at each side of the press. The machine is also so arranged that, while one stream of sheets is being folded 'carrier' size, the other streams may be simultaneously folded 'mailing' size. It may be, however, that newsdealers will prefer to have their papers neither folded nor cut. In this case the new press will accom-

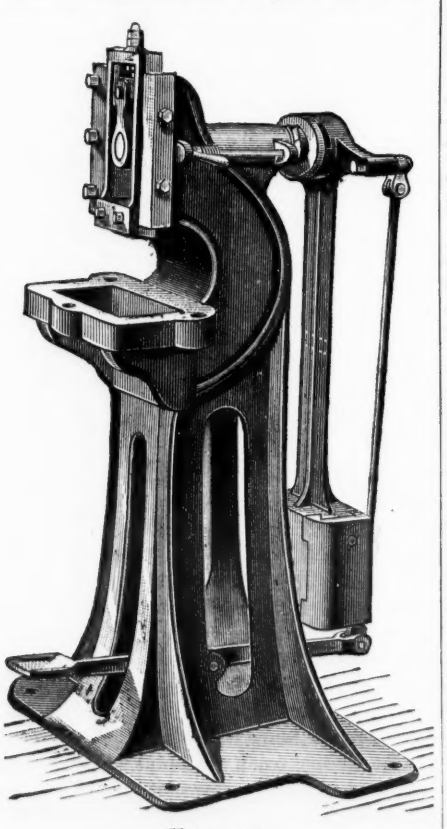


FIGURE 1.

modate itself promptly to their wants. A small wheel will be thrown out of gear on one side; a wheel will be pushed in on the other, and, with these trifling changes, causing about as much trouble as the stopping and reversing of an engine, the entire folding apparatus can be disconnected and the sheets flown flat. When they reach the collecting cylinder, 12 of them will be wrapped around it; on the arrival of the twelfth the switches will move, and the twelve open sheets, instead of traveling further by the horizontal tapes, will take a vertical direction and be deposited by an ordinary flyer on a table just beneath the first feeding rollers.

"The nominal speed of the new perfecting and folding press is about double that of the earlier perfecting presses. But since the work of the new one includes folding, its real speed exceeds even this high figure by just the time required to fold an entire edition. It is beyond all comparison, therefore, the fastest printing machine ever devised. Of course, in measuring its capacity, we must take into consideration not only the saving which it effects in time, but the great saving in the cost of labor, and the superior neatness and accuracy of its work. It can deliver 30,000 papers an hour, folded for mailing; in other words, the papers are pushed out of the receiving troughs at the rate of 500 a minute. This velocity, however, is only required when an unusual demand or a delay in sending the paper to press taxes the production of the press-room. In actual daily practice it is not advisable to drive a press at its highest speed. There is less liability to accident, and a better impression can be gained by running at a lower rate. The convenient rate for the new press is 24,000 an hour, or 400 per minute. No other press built in this or any other country, and accomplishing so many things, has ever approached this capacity."

These presses are made by R. Hoe & Co., who have extensive works both in New York and London, England.

Novel Punching and Shearing Machines.

The machines, illustrated upon this and the opposite page, are designed to take the place of all forms of hand presses heretofore used for punching, or punching and cutting off wide wrought, bar and plate iron, doing work many times heavier than has been considered possible for any but large power presses to perform.

The general principle of all the various forms shown in the illustrations, consists (as outlined by the dotted lines in Fig. 0,) in the use of a swinging pendulum, acting in the place of the ordinary weighted lever or balance wheel. The secret of the tremendously increased power, thus gained, lies in the arrangement by which the swing of the pendulum, considered as a balance wheel, is added to the gravity pressure upon the pendulum when it leaves the horizontal line. In the machines used for light work, the pendulum can be made to describe a complete circle with each complete motion of the slide, if desired.

In the illustration, Fig. 1 represents the larger of two sizes of foot presses, viz., Nos. 1 and 2; this press being designed for the use of railing-makers, boiler-makers, carriage-makers, copper-smiths, brass manufacturers, wheelwrights, and metal workers generally. It weighs about 850 pounds, and stands about 5 feet high, the pendulum weighing only 104 pounds, and swinging a complete circle, when desired. Its manufacturers claim that no style of foot press heretofore made has been able to punch heavier materials than tin, or light sheet iron, this being the extent of the power of a man when operating by the direct pressure of the muscles of the leg and thigh. By actuating the foot-treadle, this machine swings a heavily weighted pendulum which is hung upon the end of the shaft and is connected with it by a clutch which, in turn, is put in and out of gear by an automatic stop attached to the body of the machine. This little press, strange as it may seem, will punch a $\frac{3}{4}$ inch hole through iron $\frac{5}{16}$ in. thick, six inches from the edge, continuously, and with but little fatigue to the operator.

In fact, judging from its plucky performances, one is led to think that it was this very little machine which the late lamented Artemus Twain had in mind when he penned his famous lines:

> "Punch, brothers, punch with care,
> Punch a hole in the iron ba-i-r;
> Blithely sing and blithely punch
> Till the whistle blows for lunch;
> Then, when nooning time is done,
> Merrily punch till set of sun;"

but without further and more positive proof than we at present possess, it is not feasible to offer more than a simple suggestion to this effect.

This same size press is also made to act as

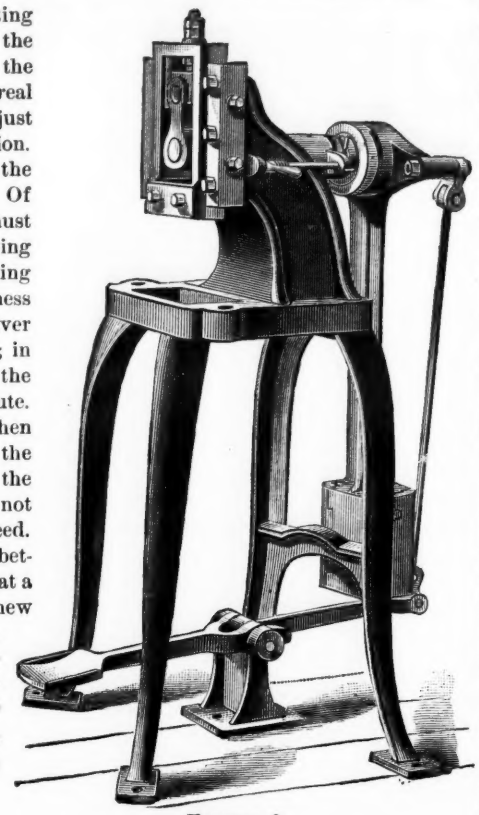


FIGURE 2.

a punch and shear combined, working by foot power. It will shear $\frac{3}{8}$-in. bar, or $\frac{1}{4}$-in. plate iron, 6 inches from the edge, or will punch $\frac{5}{16}$ths iron easily and rapidly, and is adapted for the same general purposes as the machine shown in Figure 3.

Figure 2 illustrates a foot press designed for lighter work than the preceding, and is intended more especially for the use of jewelers, pocketbook-makers, and workers in brass. It is similar in style and principle to the machine shown in Figure 1, except that it has legs instead of a box frame, and weighs about 385 lbs. It is claimed for this size that it will punch easily a $\frac{3}{8}$-inch hole through iron $\frac{1}{4}$-inch thick, as well as a hole 1 inch in diameter through iron $\frac{1}{8}$-inch thick.

As a test of the power of a foot press of this size, a 30-inch balance-wheel was attached to the shaft by means of a 3-inch belt, and driven by steam to a speed of 125 revolutions per minute, but failed to punch even an inch hole in $\frac{1}{4}$-inch iron, showing by comparison, a tremendous advantage in favor of the pendulum press.

A lad can work either of the presses shown in Figures 1 and 2, with but slight fatigue. Either of the preceding sizes can be adjusted to a nicety in operation, having an automatic gear attachment which permits continuous punching, or the punching of a single hole at the will of the operator.

This size is also made to operate by foot with the pendulum passing through and swinging below the floor, punching a hole $\frac{5}{8}$-inch in diameter through iron $\frac{5}{8}$-inch thick, 6 inches from the edge, being intended for very heavy work and the same general purposes as those shown below in Figures 4 and 5. This size is very light, while possessing great strength, the principal working parts being made of cast steel.

The machine illustrated in Figure 3 is precisely like that shown in Figure 1, in size, weight, and method of working, except that it is operated by hand lever instead of foot treadle. It will do heavier work than a foot press made from the same patterns could possibly do, punching a hole 1 inch in diameter through iron $\frac{5}{16}$-inch thick, 12 inches from the edge, with great rapidity, and but little fatigue to the operator in charge.

Figure 4 illustrates a punch and shear combined, operating upon the same principle as the remaining sizes, intended more especially for the use of iron railing makers, and silversmiths, cutting heavy bars of silver, etc, punching by hand as high as 1 inch in diameter through iron $\frac{3}{8}$-inches thick, or a $\frac{3}{8}$-inch hole through $\frac{1}{2}$-inch iron. The same machine will shear, for example, a bar of iron $\frac{1}{2}$-inch thick and 2 inches in width, at every cut.

In this machine the pendulum passes through and swings mainly below the ground or floor of the room in which the press is placed, the object of this arrangement being to secure a greater swing and increased weight on the pendulum, with a consequent heavy increase of power, while occupying less space above, a matter of considerable importance in small, or crowded shops. In this machine the crossheads and connecting-rods are made of cast steel, thus securing great strength. The handle is removable, making the lever longer or shorter at pleasure, according to thickness of metal to be punched. The handle, or lever, when at rest is below the waist of the operator, and in motion does not at any time lift higher than his breast, avoiding strain upon the muscles of the back and chest.

In general, of all these sizes, it may be said, that a large increase of power can be obtained at will by attaching additional weights on either side of the bottom of the pendulum, whether used above or below the floor. All are compact, and in appearance resemble the power press. A very valuable feature in Nos. 1, 2 and 3 consists in this, that the pendulum can be removed at any time in a few moments and a balance wheel attached to end of shaft for steam power, whenever required.

The bare statement of these results will be enough to indicate to practical men the efficiency of these novel machines. Certainly if the workings of the various sizes in active use continue to equal their present performances, this machine forms an important contribution to the list of punching and shearing tools. Its makers, the Peerless Punch and Shear Co., 52 Dey St., N. Y., claim that every part of every press is thoroughly tested before being used, and that the same careful workmanship and neat finish shown in the sample machines, will be given to every press hereafter to be made according to these patterns.

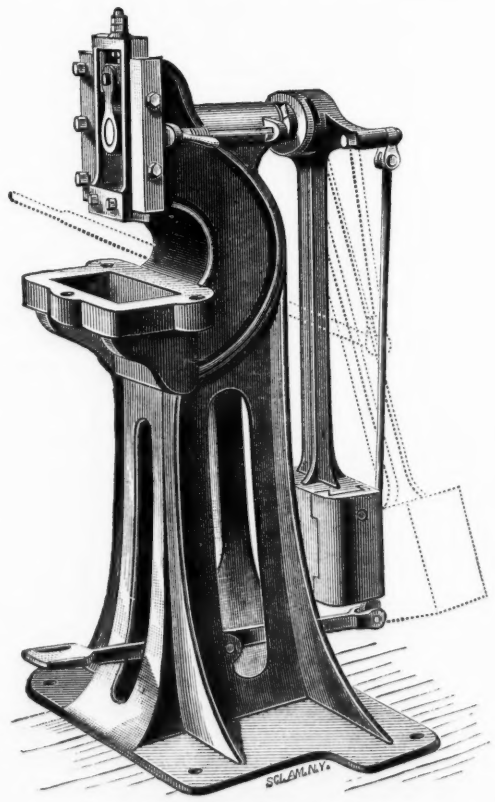


FIGURE 0.

The forthcoming report of the Commissioner of Internal Revenue will show that the tax on matches produced, in the last fiscal year, about three and a quarter million dollars of revenue, being an increase over any previous year. So far from importing matches, as we did, in large quantities, for a time, we are now exporting them to a considerable extent. This is due, in no small measure, to the new processes of manufacture by machinery of a most ingenious description. Little work is now done by hand except to pack the matches, when ready, into boxes.

The Future of the Machinist in America.

BY HERMAN T. C. KRAUS.

The veterans among the machinists speak in glowing terms of the golden time some thirty years ago, when steamboats, sugar machinery, and large steam engines were being built for the first time. The machinist then was esteemed as of some importance socially; on meeting him passers-by saluted, but now it is altogether different. Ranking little higher than the common laborer in public estimation, the machinist can barely earn money enough to support his family.

As to his business, it is machinery itself that has spoiled it; we used to accomplish more by hand-chipping than the planers do now-a-days; now people don't like to work; they are too lazy, etc , is the story our veterans tell us. But let us see what truth there is in all this, and whether the old fellows really did more work and better work than we are doing at present.

In those days not many steamboats were built, but there was a strong demand for them. Tools were neither so plenty, nor as perfect as we have them at present. The building of boats, railroads, and machines of all kinds was encouraged by the men

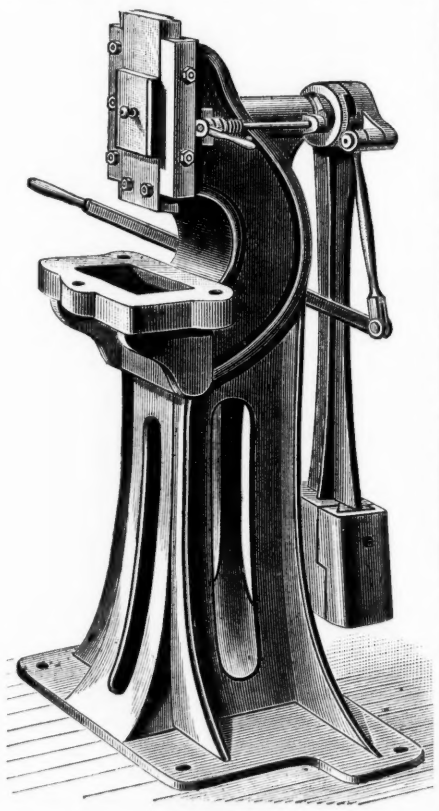


FIGURE 3.

who were clear headed enough to see the rewards in store for the promoters of such enterprises.

Naturally, then, machinists had plenty of work, and accordingly, I suppose, good pay. Machinery had power to give industry and commerce a new impulse. Machinists were esteemed by all, and soon, all over the world, they began to gain self-esteem and to become proud of their trade.

In those days machinery was young; machinists had a wider field to operate in, and there were possibilities before every man. Even to conceive the idea of a drilling machine, a planer, or a lathe, born of necessity and opportunity as it was, did not seem to require a great inventor. Improvements of great value followed each other rapidly; but if we now look back at the construction of these tools, we find them coarse and heavy, but often very simple and true to nature, their chief value being that they were really new of their kind. Then, too, really good draughtsmen and skilled constructors were few.

Now, we make more devices in a day than would have sufficed then for a month—modifications and improvements crowd upon each other's heels until we are astonished at nothing. But why is it that our machinists are so many and so ill-esteemed? The reason is plain:

A strong demand for anything cannot last long in this country. Wherever money is to be made, money will be invested, while an extraordinary demand, as in the early days of machinery, is sure to be followed by extraordinary investments—more than there is any need of, until thousands of busy brains, that are at work in inventing new and improving old machines, finally glut the market with all sorts of devices.

Presently, however, makers and inventors begin to perceive that they are losing, or rather wasting money, and stop manufacturing until the surplus is worked off and the demand and supply are equalized.

But, pending this process, the machinist's trade and position are seriously affected, because machinery purchasers can neither afford to buy new, nor to exchange, or improve old tools, since the demand for the goods made by these machines has likewise dropped off from like causes. As a consequence, therefore, the machinist has little or nothing to do. But let general business become firmly settled and begin to move forward actively, then new machinery finds a market, as good, or perhaps better than ever before. But, meantime, how fares it with the individual machinist? Will his position be as respectable as formerly? I answer, yes, and better than before.

Amongst our machinists there is a far larger proportion of educated men than was the case thirty years ago, and, having the aid of good tools, the result of the intellectual labor of many, they are able to do more work, and better work, than the simple craftsmen of the old days with their simpler tools could hope to accomplish. And, indeed, in this we do but meet the requirements of the active times in which we live. The prime requisite, therefore, of the man who hopes to succeed, is to keep up with the improvements and changes of the times, notably to know what others are doing in his line of business. No need to try to be an universal wise man, as too many are daily trying to make themselves appear; but his own business a man must know, if he would succeed in it, and he must not merely know it superficially, but *he must know it through and through.*

Some time must pass before it can be truthfully said of the great body of American machinists, that most of them are able to make their own drawings, are acquainted with the theory of their trade, and can design and construct according to their own ideas upon mechanical principles. The working machinist will no longer be in doubt whether the number of teeth in or the diameter of a wheel is the true method of calculating speed. He will readily understand the principles that underlie the action of the machines with and upon which he works. He will be familiar with steam engineering, and will gain acquaintance with many things whose equivalents are required to be known by educated men in other lines of business.

But the machinist may ask, How can a man without money do all these things? But in so asking, he does not realize how much of his own time is spent in idleness; if he reads at all, in poring over trash, which is of no value to him whatever. He does not take into account that only two hours in a week spent in obtaining the right kind of knowledge in the line of his trade, will begin, even in a few weeks, to be of value to him. He will learn, by this discipline, how to look into and to discern the causes of things, to use them in his day's work, and by doing better and quicker work, to earn better wages.

There are, it is true, some good mechanical schools in this country, but, as a rule, these concern only the higher branches of the profession (mechanical engineer's), but are useless or unavailable to the practical machinist in the workshop. Who are able to take advantage of these schools? The rich only. But are the sons of the capitalist always, or often, qualified by nature to become machinists? For these, playing at attending school is all very well, but they do not feel like going to work in the machine shop, and taking hold, practically, of hammer, and chisel, and lathe.

But how shall the American machinist gain this needed education? There is but one road, and the intelligence and industry of every man must be his own guide, aided by the helping influences that he finds all about him. I have faith to believe that the time is coming, and need not be far distant, when the sentimental admiration, that was the machinist's reward 30 years ago, will be exchanged for the true and abiding respect naturally paid to a class of craftsmen who are theoretically and practically masters of their business. And the more especially, because no other business can accomplish anything of substantial value without the machinist's aid. Requiring, as his business does, a special theoretical knowledge, the machinist ought to occupy the first rank in the line of trades; but in order to acquire this knowledge, that lies so infinitely before him, he cannot begin too soon.

As aids to home study and shop experiment, progressive machinists should club together and establish for themselves, in the center of each manufacturing district, a society or school; ordinarily a single room can be hired, if not otherwise obtained, and should suffice for use one or two evenings in each week.

What shall be taught in these evening schools? Some geometry; the elements of mechanics; the theory of steam, magnetism, and electricity. A regular constructing course should follow, applying all these single elements to one machine; this will enable the scholar to compare the whole and its various parts, and to use them all. Theory, thus reduced to practice, is simplified and held in his mind by a simple illustration. Mere drawing, as drawing, is of no value, as it omits the why and wherefore. Many persons place too much stress upon this art, valuable as it unquestionably is, not considering that it is the vehicle merely which brings the example to sight.

How shall all this be done? Where there is a will, the way opens. Nor do I regard the money question as the greatest obstacle to be overcome. A greater hindrance is the inertia which prompts our young men to haunt libraries, but to read, what? Novels, or something which merely irritates or tickles the mind without informing it.

Too many of our young inventors, even, delude themselves with dreams of the great things which they are to do by and by, dominating this trade and revolutionizing that, and all this time, perhaps, they do not really know, of their own knowledge, what even so simple a thing as a lever or a screw is.

The machinist of the future will be a good citizen; knowing his trade thoroughly, he will stand where ignorance cannot touch and envy cannot meddle. A certain honorable pride will pervade the whole body of his fellows, and lesser talent will be carried along by the ennobling contact. Workshop secrets will vanish, as the true dimensions of such pitiful selfishness become more clearly outlined.

Is this Utopia? No; it is only the freedom that is born of and produces education.

There are those who are content to live in the lower ranges of competition. If their rewards are inadequate to their expectations, it is their own fault. They voluntarily condemn themselves to inferiority. A first-class mechanic never fails to take a first class position. In social life, whoever studies elegance of manner and address is sure to be distinguished by the graces which fascinate and open the way into all circles. The athlete develops strength and muscular power, and proportions his body into a well-rounded symmetry by long and laborious training. The most skillful navigator is he who is best versed in astronomy, in the measurement of the globe's revolutions, in the position of the planets, in tides, ocean currents, atmospherical changes, natural phenomena and geographical facts. Columbus had faith in himself because he was the best-trained navigator of his age.—*Arthur's Home Magazine.*

Advance sheets of the report compiled by the board of trade of Cincinnati, for the year ending April 1, 1879, show that of all kinds there are 5172 manufacturing establishments in that city, with an invested capital of $57,509,215; the number of hands employed, 67,145; and the value of the product, $138,736,165. In forty years the manufactures have increased almost ten fold.

The cylinder press on which the Sutro, (Nevada) *Independent* is published is run by water power, "red-hot water from the Savage Mine," the next thing probably to steam power.

There is a multitude of new canal and internal improvement projects, both here and in Europe. There are the Panama and the Nicaragua Ship Canals, the Florida Ship Canal, a new railroad to connect New York and Chicago, and the improvement of the Mississippi. In England they are even talking about a bridge across the British Channel, but that looks to us like a joke. In France they have voted twenty million dollars for harbor improvements; French engineers are planning a railroad from Algiers to Timbuctoo; the Russians are about to divert the course of the Oxus into its ancient bed. In South and Central America railroad building is going on on a large scale.

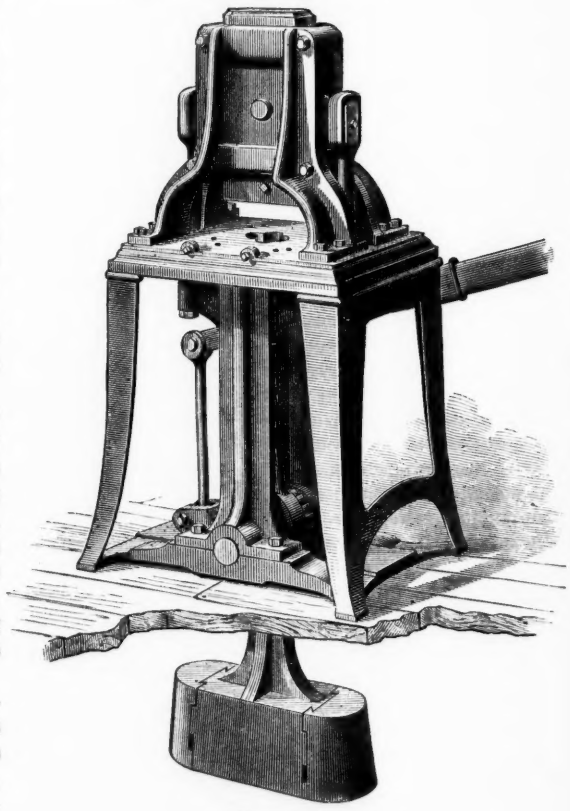


FIGURE 4.

Experience has shown that it is exceedingly unwise to suppose that a certain boy is to make a Congressman, while another will peg boots. The issue usually shows that the young lawmaker makes a cobbler, while the predestinated bootmaker becomes a foreign minister.—*Scientific American.*

The gas topic of New York now is the recent reduction in the price of gas to $2.00 a thousand, and less for large consumers. Hitherto it has been to some extent a luxury, but now the time has come for New Yorkers to appreciate what the English and French have long discovered; namely, that gas can be used in other ways than as an illuminator of the houses of the rich. Gas can now be utilized in the kitchen, workshop, and for heating houses.

Many of our people now live in flats, in which the waste heat of the kitchen range is at this season a great discomfort, to say nothing of the labor of carrying coal and ashes and the consequent dirt; to those so situated we would suggest a trial of the gas cooking stove. As usually burned there is great waste in the consumption of coal for cooking purposes, some authorities estimating that not more than two per cent. of the heat is utilized, the balance going up the chimney or heating a space not requiring it. We think this a good time to give gas a trial for cooking.—*Plumber and Sanitary Engineer.*

Milling Attachment for Lathes.

We illustrate on this page a new device applicable to any engine lathe, and intended to enable it to perform the work of a first-class milling machine. It can be attached ready for working, or removed in something less than a minute, and is claimed to work with the smoothness and solidity of the best milling machine.

Milling cutters are sometimes used on an arbor running between the lathe centers, but from the lack of a vertical adjustment, their use in this way is quite limited.

In this device the cutter arbor is parallel to the line of the lathe centers, and is driven by a gear attached to the lathe mandrel. The arbor is carried by a rectangular frame swinging between the lathe centers. A "U"-shaped clamping plate carries a tangent screw, which engages the edge of the ring plate which forms a part of the swinging frame.

As the tangent screw is turned, the frame slowly revolves between the lathe centers, raising or lowering the cutter. It is clamped at the proper height by two clamping nuts, on opposite sides of the ring plate, of which the front one only appears on the drawing.

The "U"-shaped plate is secured to the lathe bed by a bolt and short cross-bar and nut underneath.

The driving gear is attached to a small face plate on the mandrel, as a chuck would be, and carries on its front side a steel center, which forms the running center of the lathe, bearing against a countersunk stud in the projection of the cutter frame. The cutter arbor runs between hardened steel centers, of which the right hand center is adjustable and secured by a jam nut. The shaft is of steel, with hardened ends, and adapted to a cutter with $\frac{7}{8}$ hole.

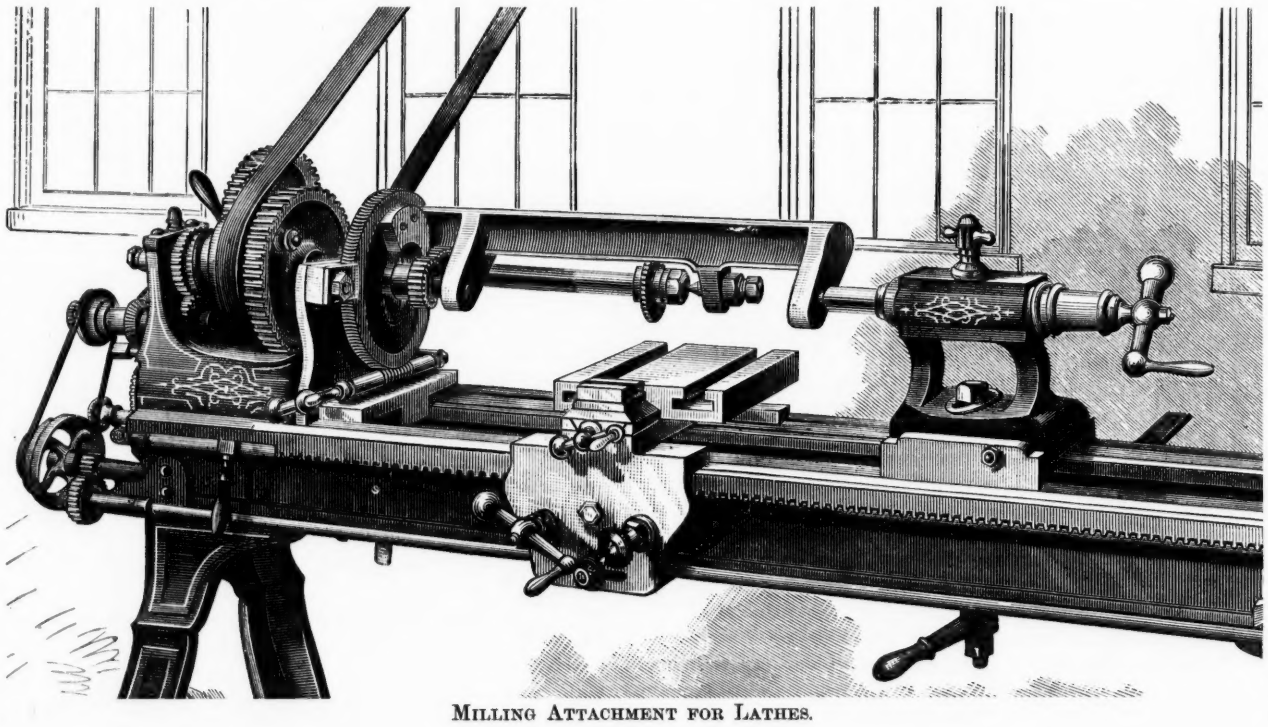
It will be seen that the cutter frame is secured at three points, which lie in a horizontal plane like the angle of an isosceles triangle; the running center of the lathe occupies a central position, and is relieved, therefore, of all leverage and undue strain. The cutter frame, when clamped, is as solid as a part of the lathe bed itself. The cutter, therefore, works smoothly while taking a heavy cut, and, as the friction is upon three centers only, it is hardly appreciable, even when running at high speeds.

The bed-plate runs on the cross slide of the lathe carriage, and is linked to the tool head, so as to traverse with it. It need not be moved while the lathe is performing its ordinary work, as it is not in the way; it serves to protect the slide from chips and dirt, and is often of service in boring cylinders, &c.

By relaxing the nut under the lathe bed and sliding back the tail stock, the cutter frame and clamp plate are released and may be lifted off together.

The tangent screw is adjustable vertically on its plate, so that there is no trouble in setting it, once for all, at the proper height.

An ordinary parallel vise, mounted on a bar or shank fitting in the tool post, may be used to hold work, thus dispensing with the bed-plate altogether. This milling attachment is manufactured and sold by the inventor, William Main, Piermont, Rockland Co., New York.



MILLING ATTACHMENT FOR LATHES.

At a meeting of the German Machinists' Union, of New York, a report of the operation of the free employment agency, established by the union, was received. It was shown that only three members were without employment.

Extracts from Chordal's Letters.

Mr. Editor:

* * * In giving you Mr. Hill's experience with cylinder lubricators, I took the liberty of adding some of my own valuable views, and I have since found that many experienced steam users coincide with me. The first device used for oiling the inside of an engine was a hole in the steam chest, with a plug screwed in it. To use this device you stopped the engine, took out the plug, poured in your oil, stopped up the hole again and set things to moving. The first improvement made was to put on a common open oil-cup with a cock in it. Directions for use same as in former case, only you don't have to unscrew anything. The next happy thought was to screw a lid on the oil-cup. That fixed things so the oil could be got in without stopping the engine, but experience proved the thing to be dangerous to finger. Then we had what was, and is, called the oil globe, which is simply a funnel with two self-draining cocks and a reservoir between the cocks, the whole acting on the canal lock principle. This was mean in several ways. It would soon wear out, or would freeze up over night and burst; it would make a beef fry out of even an expert's fingers, and under the best conditions would put half the oil on the inside of the cylinder and the other half on the outside. With all these things no oil could get into the engine, if the engineer didn't see fit to put some in the oiler, and, as he generally had a mortal dread of the affair he often didn't see fit to. This led genius to wrestle with automatic devices—something you could put a quart of oil in and depend on its being properly fed without attention. The animal system of digestion is simpler than many of these marvelous lubricators. If one happened to work nice the engineer didn't understand how it did it, and if it happened to stop working he didn't know why it did that. The most radical improvement made in engine lubricators was to take them off and run without any. A few years ago the wooden knob was invented, and then we got gauge cocks, and globe valves, etc., which a prudent person might approach, and at the same time engine lubricators went back to their first love and commenced the whole thing over, and I am under the impression that most engineers to-day prefer an oil-cup with a cock and cover, both fitted with wood. The queer part of the lubricating business is, that through all the stages of elevation, or degradation, or whatever you may call it, the city of Buffalo has had and used a simple and efficient little hand pump for the purpose. You might see one once in a while elsewhere, but Buffalo-built engines always had oil pumps, and oil pumps most always came from Buffalo.

That city recently had an attack of the automatics, and the consequence is, they have put a ratchet crank motion on their pumps, and work it from any part of the engine.

The first that I saw were invented by the Chief Engineer of the Lake Superior Transit Company, and were being used on that company's vessels. The reservoirs were large, and the amount of feed nicely adjustable. Last week a Boston gentleman showed me a somewhat similar one, gotten up in Buffalo, in good commercial style. It looked much less expensive than any of the other automatic lubricators I have ever seen. I was informed that it would soon be in the market, and whether it is, or not, I begin to feel convinced that Buffalo is in the right path, and that the engine lubricator of the future will be a pump driven by the engine. One good thing about them is, that an ordinary engineer can understand them without going into the study of the natural sciences.

* * * * If the owner of a genuine simon-pure machine shop, and by that I mean not a systematized manufacturing establishment, wants his eyes opened, let him take a note-book into the shop and keep an account of the *money spent* in turning up mandrels for one month. There are some nice machinists in the country who don't know what I am talking about when I refer to turning up mandrels, and if they would go into one of these common shops they would not recognize a mandrel if they saw it. In ninety-nine shops out of a hundred, each man fits his mandrels as he goes along. He keeps them lying on the floor under the foot of his lathe always. All the mandrels in the shop are, of course, common property.

If Walker wants to turn up a job, he takes the piece with him and goes down among his lot of mandrels and tries to find one which will fit the hole he has bored. He don't find one big enough, so he goes to Dix's lathe, and don't find one that isn't too large. He makes the grand rounds, and then drops into the blacksmith shop and picks out of the scrap pile a piece of two-inch round iron, may be eight inches long and may be eighteen. He goes back in the shop and centers it, and starts as though he thought of drilling the centers, but he concludes he only wants to use the thing half an hour, so there's no use in drilling. Then he gets it in the lathe, and when he gets one end squared up, he concludes that it is too much trouble to turn the thing around and square the other end, so he proceeds to make his fit. First a heavy cut, then a light one, then two more light ones, then he files it, and then he tries it, and then his chin goes up and his eyebrows come down, for his mandrel fits like a mouse's tail in a flour barrel, as he expresses it between oaths. Now it luckily happens that he has only turned up about three inches in length, so all he has to do is to turn another three inches and get a good fit, you know. He is bound to have it big enough this time. Soon it is done and he proceeds to drive it in. The thing he drives through is *always* an old gear brought in from the scrap pile years ago. The hole in the aforesaid gear is so big that it would let his job right through, so he hunts up something smaller to lay on it. He finds it necessary to use two or three of these underlays, so as to reduce size properly. He has built up a cob house about two feet high, and, ten chances to one, one of the "cobs" is a nicely-bored piece of finished work. No matter; he puts his job on top of the pile and sticks the mandrel in. Then he hunts up a nut *always*. He don't find any loose one, unless he takes the one he uses for a candlestick and keeps stored on the inside of his lathe. He finally takes one off of one of his bolts, and carefully balances it on the craggy rough end of his mandrel. Then he calls Dix to hold the mandrel. Dix does so, and Walker goes for the sledge and comes down on the thing three times. Too tight. He lets Dix go, and turning the thing end for end, sets the nut on the mandrel, and comes down heavy to drive the mandrel out. Mind you, he is getting mad all this time, for he is having bad luck. He strikes a crooked lick and knocks the whole cob house down, and the hot-pressed nut splits, one half just missing Lambert's ear on its way to the foundry, the other half goes out the front door into the street. He erects the structure again, and fishes out his candlestick. After knocking the greasy nut off two or three times, he gets his mandrel out and files it smaller. He is getting a little bit madder. Now he takes it out, takes the dog off, goes and hunts up the nut under a vice bench, and starts the mandrel. It drops in clear up to the shoulder. He was too mad when he filed it last. He is entirely too much out of patience now to turn up a new place, so he goes to a vice, and screwing his mandrel in it, he proceeds to raise a burr all over it with a prick punch.

Every thing is lovely now. He cools down and finishes his job, but in the meantime his job slips once or twice, and he is compelled to prick-punch some more. When he gets done he throws the mandrel under his lathe. The next time he uses that mandrel he will want it a quarter of an inch smaller, and will make it so, and he may or may not have luck in making his fit. But still the necessity of drilling the centers, or of squaring that other end, does not force itself upon him. In a month or so this mandrel has been made to do for some size by every lathesman in the shop. It is one and seven-eights at one end, and three-quarters at the other, for it has been used for every thing it could be made to answer for. In course of time Walker is looking for a mandrel about an inch and a half. He has his job with him and is searching under Moore's lathe, and finds this identical mandrel, and as good luck will have it there is a place on it which exactly fits his job. He is smart enough to put it in the lathe to see how much the small and limber end of it has got bent during late drivings. He finds that no part is true, and that no two parts are true with each other, which shows that it got a new bend each time it was used. The part he wants is almost true. He can see it wink but thinks it will do. He uses it. Here are five botches at once. First, a mandrel which is not true; second, an inch and a half mandrel which must use a two-inch dog, and which is made very limber by having part of its length three quarters of an inch in diameter; third, a mandrel without drilled centers, etc.; fourth, a mandrel with such a rough surface fit that it must be driven with a sledge; fifth, a machinist who will play unnecessary parts in the business; and sixth, a shop owner so

reckless of money as to pay each year for mandrel turning, an amount which would three times over buy a good set of hardened and ground steel arbors. Take your note book into the shops. If you have a good set of mandrels they will save big money, and will make your sizes uniform, because the boys will get into the habit of making a two inch hole two inches. Such mandrels are ground after hardening, and the surface fit is such that a lead or copper hand hammer will drive a three-inch mandrel for twenty-four inch work. When Walker wants a mandrel he would know just what to get, and when he would go after a dog he would get the right one, instead of lugging his job all round the shop to find a mandrel, and then lugging the mandrel around to find a dog to fit the big end.

Don't dream of making nice mandrels. Go and buy them the same as you would buy wood screws, from some one fixed for making them. * * * *

Very Respectfully,
CHORDAL.

Engine Proportion and Construction—Valve Motions for Quick Speeds.

Editor American Machinist:

In your number for the month of September 1878, Mr. Wm. Lee Church sums up in his article on Piston Speed, by saying that it is unfortunate that a limit in this direction is imposed in most automatic engines, by the necessity of some form of independent detaching, cut-off valve gear, which admits of only a limited number of strokes per minute, regardless of the size or proportions of the engine.

The above presentation of this subject is certainly correct in every particular. It is very unfortunate that something in the way of a detachable valve motion to act with certainty and without unnecessary noise and wear, under rapid revolution, has not been perfected. I mean by rapid revolution 85 to 150 per minute. If there is a detachable gear answering the above requirements it has failed to come to general notice. As to the highest number of revolutions just named, I do not think it possible to introduce a perfect, or even ordinary working, independent *drop* valve gear; but I do believe a detaching motion can be devised that will "pass muster" at 100 revolutions per minute. When this much desired object is effected, however, the *laft* on steam valves will be materially reduced from the amount now generally given, viz.: from ½" to 1¼". The smallest figure is too much by at least one-third, for a two hundred horse engine, when the ports and valves are properly designed. Something of this kind would enable us to speed all engines with a stroke of from 30" to 48" as high as 100 revolutions per minute, if required, without fear of failure on the part of valve gear.

The engine of the future will be the one that satisfies the high or rapid motion requirements. The old 350 feet per minute and 60 revolutions are things of the past. The old idea about *non-compression* at the return finish was, by exhaustive and costly experiments, exploded in England and France ten years ago. Engineers then proved that *no* steam engine would work with its greatest economy without proper-sized steam and exhaust pipes and ports, quick *piston* speed and crank-shaft revolution, coupled with liberal compression.

It was fully established at the trials and tests just referred to, that it was a mechanical impossibility to reach the desired results in piston speed, crank revolution, and the attending economy of fuel, without a compression on the return to a point in pressure, at least three-fourths of the *initial*. Otherwise the most important details of transmission soon perished, and *every* part of the engine suffered from undue strains.

I would like to ask the non-compressionist to consider for a moment that portion of the crank circle within 35° of its *finish* or central plane. Then consider the piston, piston-rod, cross-head, and connecting rod, moving (at the speeds used in these days) with their *foot pound* momentum, due to the velocity and weights, and I will then ask him if *nearly* all of that part of the crank's path indicated above, is not wasted energy, *without compression*.

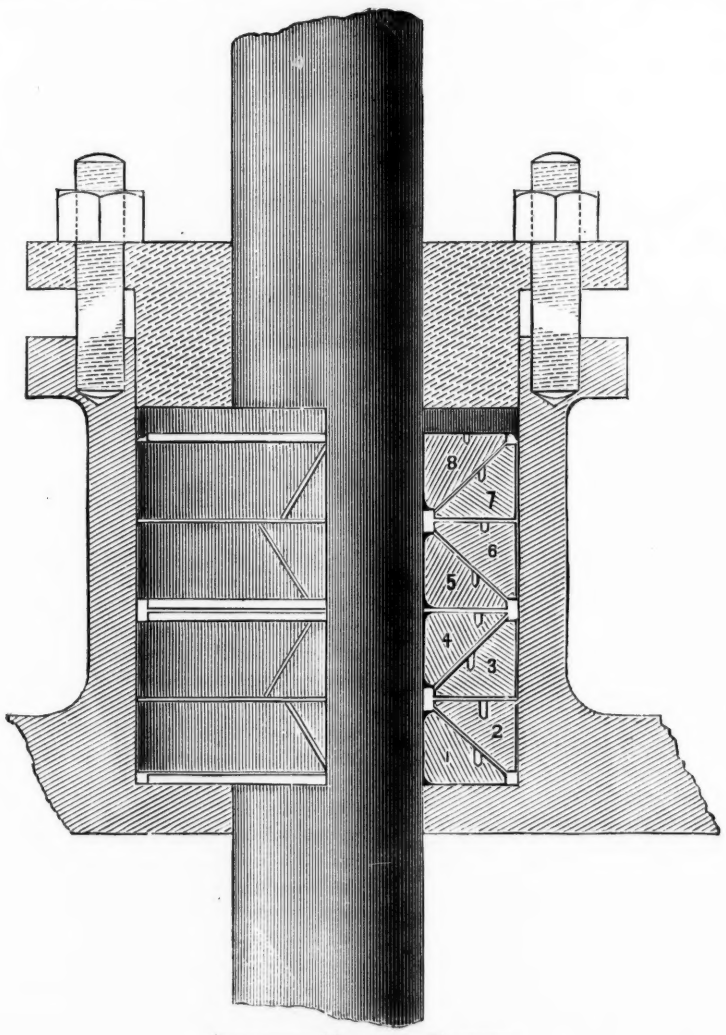
If he does not utilize the vapor on hand, at this point, he will not only be chargeable with a loss at the cylinder, but will certainly have a terrible account standing against him in the matter of demoralized cross-head and crank pins, to say nothing of the main journal. Compression has come to stay with us, gentlemen, and we must study to use it to the best advantage. The loss by extra valve leakage, in *short* stroke and *quick* revolution, is counteracted by the consequent saving in HEAT.

WM. H. HOFFMAN,
Passaic, N. J.

Improved Sectional Metallic Packing.

Our illustration herewith embodies recent improvements in a piston and valve packing, which has been prominently in use for several years. The improved packing has been adopted by many leading steam users, and may be briefly described as follows:

A metallic composition is applied as a condensing material, a portion of which, by virtue of its peculiar properties, adheres to the piston rod, the object being to produce a perfectly smooth surface on the rod, and to reduce the friction, while at the same time possessing softness enough to avoid affecting it injuriously. The packing is composed of conical shaped rings, those again composed of two parts; on the top ring a gasket of soft packing is laid, which enhances the elasticity, as this diagram shows. The exterior cone presses the interior against the rod, and the interior presses the exterior against the wall of the stuffing-box, and no matter how great the pressure it will remain at all times safely locked, in consequence of each ring being a valve seat in itself, and each being divided into two parts, the whole will be elastic and work easily. The advantages claimed for this metal packing over that heretofore in use, are the following:



IMPROVED METALLIC PACKING.

1st. It gives a perfectly tight stuffing box, steadying the rods and stems, with little or no friction.

2d. It will last from one to six years.

3d. It keeps the rods and stems perfectly smooth and requires little lubrication.

4th. It will not corrode the rod when the engine is not in use.

In this series of semi-annular rings (each section being composed of four pieces), it should be noted that the corresponding pieces in all the sections are exactly alike, so that any piece broken, injured, or worn can be easily replaced.

These sections also are so placed as to have intermediate annular recesses, within which the water of condensation may be collected, and which, moreover, will permit the entire packing to be taken apart for purposes of inspection, or reset from time to time, in case of wear. This packing is manufactured and furnished by the inventor, L. Katzenstein, 35 Desbrosses street, New York.

American Cutlery in Sheffield.

It is stated that Senator McPherson, of New Jersey, who is now abroad, was introduced, before leaving New York, to an English gentleman who was buying American cutlery to export to Sheffield. The Senator said he was surprised at this; the idea of manufacturing cutlery in this country to export to Sheffield was more strange than that of sending coals to Newcastle, for anthracite could be sent at a profit to the latter place. The Senator asked the gentleman what in the world he could do with American cutlery in competition with the world-renowned Sheffield cutlery at his door. The Englishman replied that he had contracted with a Connecticut manufacturing firm for $250,000 worth of cutlery, to be stamped with his Sheffield trade-mark, because he could get it delivered in Sheffield 10 per cent. cheaper than he could manufacture it himself. "But," said the surprised Senator, "how about the quality of cutlery you have contracted for—how does it compare with the celebrated cutlery of your country?"

"Sir, it is, if anything, superior. You have the best steel in the world, and with your labor-saving machinery you can manufacture the best of cutlery. Your financial troubles, resulting in the high cost of everything, including labor, being reduced to hard pan, will prove in the long run to be the best thing that has happened to your country. You will soon be competing with Europe for the markets of the world, and the time is not far off when you will rank with England as a manufacturing nation."

Labor Strikes.

The iron moulders are striking for higher wages in various parts of the country.

The flint glass workers in Allegheny City, Pa., who were on strike, have compromised with their employers and resumed work.

A mass meeting of the striking miners of the Birmingham Coal Co., Pittsburgh, Pa., was held Aug. 11. A brass band, flags and speakers roused their enthusiasm.

The striking mule spinners of Fall River continue to receive relief from various labor societies.

Seed hands in a Chicago cigar manufactory struck for an increase of $1 a thousand in their wages.

Blacksmiths are striking (on their anvils) in every town from Maine to Texas.

Chicago brickmakers struck for 25c. a day advance, which was conceded, Aug. 13th. They then promptly struck for another advance of 25c. a day, which would make their wages $2 to $2.50 a day. Three hundred hands are in the strike.

The St. Louis coopers still hold out in their strike.

The hands in the beef canning establishment at East St. Louis are on strike against a reduction from $1.50 to $1.25 a day.

A gang of workmen recently "struck oil" while drilling a well in Butler County, Pa.

The employees of the spoke and wheel factory at Elizabeth, N. J., struck for wages due. They claim $25 to $125 each, and spoke for it so often without effect that they began to tire, which raised their temper and precipitated a strike. Being true fello(e)ws, their carriage during the difficulty has been without fault.

The iron moulders of Philadelphia recently held a meeting, and passed resolutions of sympathy with the strikers of the Reading Hardware Works.

The hatmakers of Crofut & Knapp's factory, South Norwalk, Conn., are on strike for a return to their former wages, which were cut down last spring.

A number of striking glass-blowers at Ravenna, Ohio, started a co-operative lamp chimney factory, and are doing well. They followed the example of a lot of workmen at Beaver Falls, Pa., who are conducting a flourishing co-operative glass works.

The miners lock-out at Boonsboro, Iowa, still continues, with no signs of a settlement.

The chainmakers of the Cradley Heath Dist., Eng., have struck. They wish to be free from their fetters.

The Charcoal Burners' Association (mostly Italians) at Eureka, Nev., recently struck for higher wages, and refused to let other men work in their places. A riot ensued, the militia was called out and five of the rioters shot dead. At last accounts, the trouble was not ended.

It is rumored that there will be a strike of all the coal miners in Iowa, 3,200 in number, on an agreed day in October.

It is thought that the spinners' strike will, doubtless, lead to the general introduction of spinning frames for filling, in place of mules. A filling motion has been invented by Mr. James P. Hilliard, Superintendent of the American Linen Mill, that is reported to do very satisfactory work.

An advertisement in a Vermont paper of last week reads: "Whereas, my wife [name given] has separated herself from me, and refuses to assist in my support, I hereby warn all persons from harboring or trusting her on my account, as I shall pay no debt of her contracting after this date." We should not be surprised if the fellow who inserted the above notice has set himself up as a candidate for the legislature, which renders him too busy to purvey for his own sustenance.

The Holly system of gas making (whatever that may be), in combination with steam heating, is attempted to be introduced in Lynn, Mass. The gas company has of course opposed it, giving the usual incontrovertible reasons why one company is better than several.—*Plumber and Sanitary Engineer.*

Steam Boiler-Tube Cleaner.

Many experiments have been tried in order to develop the most simple and effective way to remove the deposit of soot and ashes in boiler tubes; for it is a well known fact that even a thin coating on the inside of a tube affects very materially the evaporation. As there has been no successful way by which the small deposit can readily be removed, it is allowed to accumulate to such an extent as to completely fill the lower tubes, thereby utterly destroying their use. The best way to prevent tubes from being filled up entirely, is to clean them often.

Our attention has been directed to a little apparatus, shown in the adjoining illustration, which we will describe. B represents a hollow casting or rose-head, which has slots for air in the edge. In the center of this head is placed a wheel, A, with spiral shaped wings or arms. This rose-head is attached to a small pipe, F, to which is connected a small stop cock. This is screwed fast to a tee coupling, C, for convenience in using; and, to avoid burning the hands, the whole has been attached to a wooden handle E. Having thus described the apparatus, we will also say a word in regard to its application. Steam is to be conducted to the apparatus through a flexible tube or rubber hose attached to the top gauge cock, or any other which may be most convenient, the other end of which communicates with the tee coupling, C. The rose-head being placed in the tube, the steam is turned on and enters the tube in a rapidly revolving screw-like form, caused by the great velocity of the spiral fan-wheel, A, and the air, which is drawn through the air spaces or slots in the rose-head, increases the current which is created by the revolution of the fan collecting the accumulated sediments in the tube, and causing it to revolve with increasing speed and force as it traverses the whole length, until ejected at the opposite end. The arrangement of the handle D and cock are such that the operator can, on changing from one tube to another, relieve the rose-head from all pressure by simply turning the handle.

This apparatus, if handled with proper care, will last for many years. The inventor claims that an engineer or fireman can clean out more tubes in an hour, with this apparatus, than with the ordinary scraper or brush in eight or ten hours, and, as the action of the steam—passing from the rose-head into the tube—completely moistens the soot, and prevents it from rising and flying about in all directions, the work which has heretofore been so disagreeable can thus be done in a satisfactory manner, and the operator be entirely free from dirt

This apparatus is always ready for use, and can be applied at a moment's notice, and the time consumed to clean a boiler with, say 100 tubes, will occupy only about 15 to 20 minutes, and, by a daily use of this apparatus, the tubes are kept so thoroughly clean that the inventor claims a saving of fuel may be effected, ranging from 10 to 20 per cent.

The above-described tube-cleaner is now being introduced by William Cooke, successor to Cooke & Beggs, 6 Cortlandt street, N. Y.

An innovation in the passenger navigation of the Hudson River, in the form of steel steamboats, is contemplated by the company which plies between this city and Albany and Troy. The weight of a steel boat is said to be considerably less than that of an ordinary wooden hull, and its capacity for fast travel is proportionately greater. When the new boat is completed and the Vibbard is remodeled, the two will form the regular line, and the Drew will be used as the spare boat. It is understood that the engine for the steel steamer is in process of building at the establishment of Fletcher, Harrison & Co., on West street, in this city. The firm of Harlan & Hollingsworth, and other Delaware River ship-builders, are mentioned in connection with the construction of the steel boat, but to whom the contract will be awarded is undecided.

Prevention of Injury from Machinery.

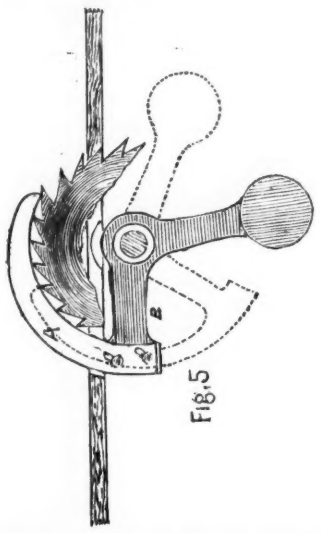
BY PROF. JOHN E. SWEET.

Some six months ago I designed and put upon a Walker Brothers' saw bench, at the Cornell University Shop, a guard to protect the operators from the very common accident, forcibly expressed by the editor of the *Syracuse Sunday Times* as "another man shaking hands with a buzz-saw."

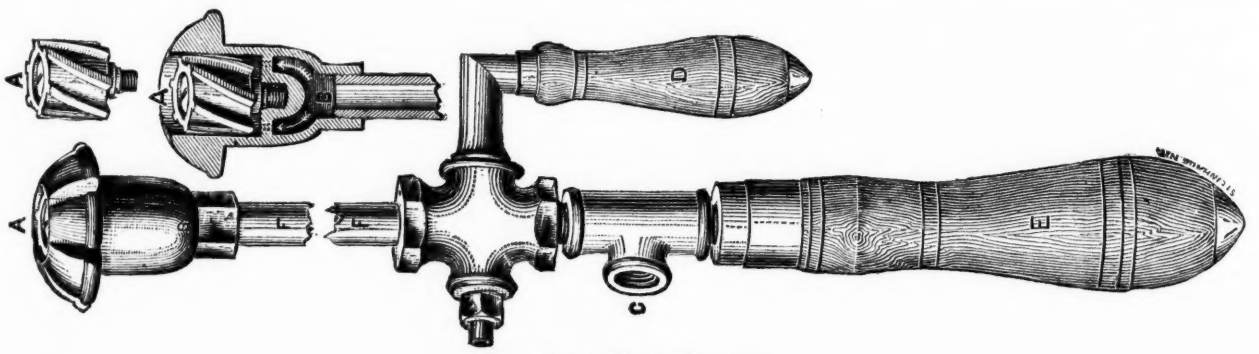
Since that time I have kept a pretty fair account of the accidents reported as coming from the use of these indispensable machines, and making a fair estimate from this basis, and dividing by two, I find the number of hands and heads mutilated in the U. S. every year can not fall far short of 5,000. Among the accidents reported two men have lost their lives, both of which were occasioned by sticks catching upon the saw. With these facts it would seem that any device that will in a measure prevent the worst, and reduce the extent of the others of these accidents, ought to be of enough value to lead to an extended adoption. To fix up a rig to keep a man's hand off of a buzz-saw would seem to be a matter of no great difficulty; but, so far, I think it about as hard a subject as a rotary engine. The thing has to get out of the way for the stick to be sawn and in the way for a man's hand. It must keep sticks off from the back and top of the saw; must be so perfect as to not get out of order (for if it does it will never be in order but once); it is never to interfere with using the saw in any way, shape, or manner, and be simple in the extreme.

The Walker Brothers' saw-bench, that I had to deal with, was one of the kind where the saw is raised and lowered through the table; is made to use for both cross-cut and slitting, saws bevel and miters, and so was one of the worst to deal with. To attempt to illustrate and describe the particular arrangement would be more confusing and less satisfactory than the more simple arrangement illustrated in Fig. 5, which shows the device as applied to the common saw bench. The guard A is of sheet steel of about the thickness of the saw, or may be even thicker, so as to serve as a spreader. It is secured to a swinging arm B, and arranged so as to be easily adjusted to compensate for the wearing of the saw. The arm B turns on the end of the journal-box, and has a weight cast upon it tending to keep the guard in the position shown. When sawing stuff less than the depth of the saw, the guard remains in its normal position; when stuff thicker than the cut of the saw is worked, it turns back the guard until the kerf passes over it, and after the stuff passes by, the weight returns the guard to its original position. The table may be raised or lowered without interfering with its working.

I wish some of your ingenious readers would invent some way to get people to put this device on their saws. Can not some one get a saw-builder who never reads the papers to steal it? The trouble is—workmen's hands don't cost anything and this device does. By the way, here is a text for another chapter. If workmen will not care for themselves against sickness, danger, or life, why should their employers care for them? Illustration: I was at one time connected with a concern in which a dozen or more emery wheels were kept running. A score of people were at work in the same room, and we had erected a large tube in front of the wheels and a suction fan to draw off the emery dust. At times the belt for driving the fan would get off (I never saw a fan with half enough belt



power) and not one of the 20 men in the room took interest enough in their own lives to put the belt on. We then improved matters by using the same fan to blow the blacksmith's forges; that worked, but then they knocked down the tube in front of the wheels. This was ten years ago; the establishment is larger now and I was told yesterday that 13 of their men had died during the last twelve months with too much emery and grindstone dust on the lungs.



NEW STEAM TUBE CLEANER.

Another Triumph of Yankee Genius.

A syndicate of five English carpet firms, according to the Manchester, (Eng.) *Guardian*, have purchased the patent rights for an ingenious carpet-weaving machine invented by an American, which enables them to produce a carpet—a velvet pile, in appearance and quality said to be a most luxurious article—at a very low cost, which they have named the Royal Axminster. The machine is said to be very simple, occupying only half the space of the ordinary carpet looms. The worsted yarns forming the face of the carpet are wound from ordinary bobbins on long bobbins the width of the carpet, the colors being arranged by a comb as the pattern requires. The ends are passed through metal tubes for delivery, and the bobbins in proper sequence are then fixed on an endless chain over the loom. As this chain revolves, metal clips seize each bobbin in turn, take it off the chain, and dip the ends of worsted among the warp threads of the carpet. Here they are at once firmly fixed, and a circular knife cuts off the worsted at a proper level. The bobbin is returned to the chain, and the succeeding one dealt with. Women are now working the looms successfully, and earning good wages. The process is considered likely to revolutionize the trade in Axminster carpets.

In Germany and Austria women seem to do most of the farm work, and often the heaviest part of it. To sweep the streets of great cities, to trundle overburdened wheelbarrows or handcarts through streets crowded with swift-going droschkies, to split, saw or pile firewood, to serve as unskilled laborers in glass and iron works, foundries and machine shops, to carry stone, bricks, sand and mortar to masons and bricklayers working on the upper stories of the highest buildings, will not seem to the average American woman strictly feminine occupations. Yet, so long as the flower of masculine youth and the vigor of European manhood are to be dedicated, as they now are, to barracks and camps, such must continue to be the occupations of the mothers of many future American citizens.

New Balanced Slide Valve.

To make a balanced slide valve that will be steam-tight, and remain so for any length of time, without careful attention and adjustment, and have the smallest amount of friction in its movement, has been the aim of a great many practical engineers for the last thirty years. The number of patents taken out for devices having this object in view is quite astonishing, and the small number of those that have been more or less a practical success, show in themselves a large amount of ingenuity and skill.

Mr. Thomas Adams, in 1866, found, by careful experiments, that on a locomotive on the North London Railway, that where the actual power developed in both cylinders was 840 H. P., that the friction on both slide valves was 54.9 H. P., and the friction of the eccentrics was 74.3 H. P., together making 129.25 H. P., being 15 per cent. of the whole power of the engine. This means that the efficiency of the engine as a motor was impaired to that amount, and that fuel was burnt to the same extent without doing any useful work. And this does not cover all the evils incidental to an arrangement of slide valve working under a variable load, due to the pressure of steam in the steam chest, multiplied by the area of steam and exhaust ports. The eccentrics, with their attachments to the shaft, eccentric straps, rods, pins, link all the connections through to the yoke that embraces the valve. These parts have all to be made proportionately strong to move the great load the valve has to carry. The cost of repairs on this part of the machinery of high pressure engines is generally more than all the rest put together. Any practically successful plan, by which the load on the back of the valve can be reduced to an amount just sufficient to keep the valve surfaces in contact steam-tight, is something that all practical engineers have been anxiously seeking for.

The plan of balanced slide valve, herewith shown, consists of a flat plate slide valve in combination with an automatic abutment plate, having a projecting ring formed on the back of the abutment plate, of an area so proportioned to the area of the ports in the cylinder face, that a pressure is obtained on the back of the abutment plate, just sufficient to keep the surfaces in contact steam-tight, and in case of wear of the slide valve, the abutment plate can follow it up and maintain it steam-tight without any adjustment. The abutment plate has this feature in its action, that it relieves itself like the ordinary slide valve, when the pressure of compression in the cylinder is greater than the pressure in the steam chest.

The abutment plate is balanced to the same extent that the slide valve is. For this reason, that no matter what part of the stroke the slide valve may be in, there is always open communication from each cylinder passage through the slide valve and chamber in abutment plate to the chamber in steam chest cover, the exhaust chamber to steam chest cover, and each chamber from cylinder passage to the steam chest cover, being all three separate and distinct, so that all differences of pressure on the under side of the valve is transferred to the separate chambers in the steam chest cover.

The slide valve face next to the cylinder face admits only half the volume of steam *directly* into the cylinder port, the opposite face next to the abutment plate admits the other half volume of steam through the port

in abutment plate into chamber in the same, which connects to passages passing through the slide valve into the cylinder passage. In exhausting the steam, the lower exhaust edge of the valve opens the whole length of the cylinder port, the opposite exhaust edge, next to the abutment plate, is also open to the cylinder passage the length of the cylinder port, and continues so, until the cylinder port is more than half open, obtaining by this means an exhaust opening equal to the full area of cylinder passage, when the exhaust edge of valve has traveled over only half the width of port, thus giving an early and free exhaust when most required, and about double that obtained by the ordinary valve.

Fig. 1, in the accompanying illustration, represents a longitudinal section of the cylinder face and slide valve, upon the top of which rests an abutment plate, the joints of which are made tight by means of split packing rings, placed internal and external of projecting ring on the back of abutment plate. Two chocks are secured to the small cover, which is bolted to the steam chest cover. These chocks divide the annular space in projecting ring on the abutment plate, into separate chambers for each cylinder steam passage; the central part of the ring forms the chamber for the exhaust port. Fig. 2 is a transverse section of Fig. 1. Fig 3 is a plan of abutment plate looking from the top.

Fig. 4 is a half plan of slide valve and half plan of ports in cylinder face.

The advantages claimed by the inventor for this peculiar arrangement of balanced slide valve are, namely, simplicity and cheapness of construction (as the work can all be done by machinery), it can be readily applied to engines already running, automatic in taking up the wear of the valve, never requiring adjustment, relieving itself under compression, and with an exceptional early and free exhaust.

For further information in regard to rights to use these balanced slide valves, and for plans furnished for the same, address the inventor, John Fish, M. E., (of the Pneumatic Tramway Co.) 145 Broadway, New York.

FIG 1

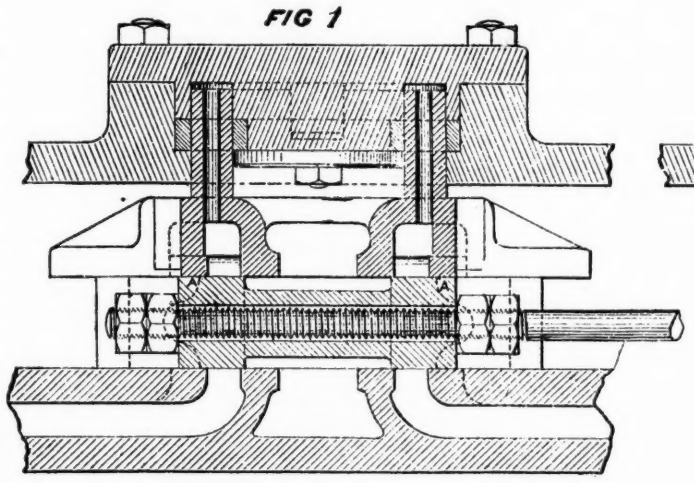


FIG 2

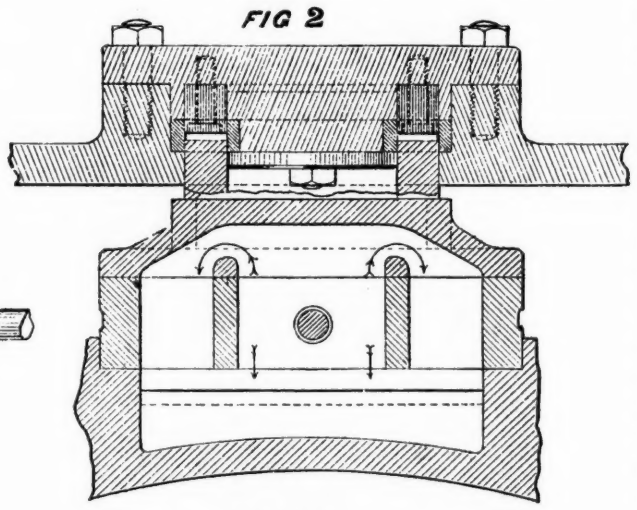


FIG 3

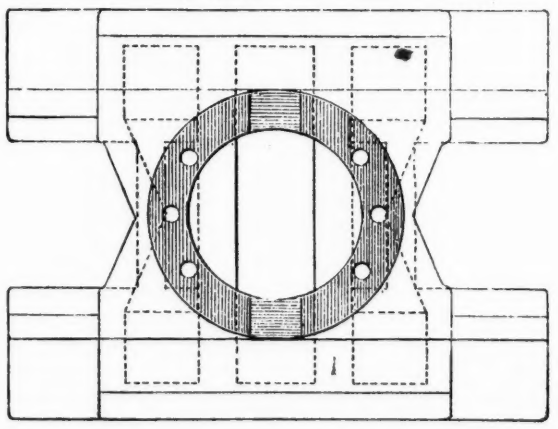
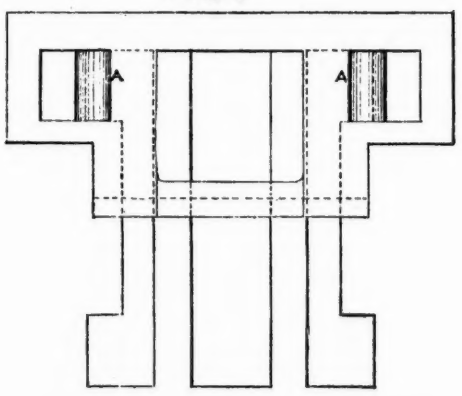


FIG 4



Condition of Industries.

We have been looking over such of our exchanges as represent particular trades and occupations, with a view of extracting reliable information as to the present condition of leading industries. The clippings which we give below, all give evidence of a better and more satisfactory trade.

IRON.

There seems to be demand for all the iron that can be found, and a disposition on the part of buyers to anticipate their requirements, in strong contrast to the feeling which existed last year and during the early part of this. There are many operators who boldly assert that iron is bound to still further advance, in spite of the fact that almost every available furnace in the country, not already in blast, is preparing to add its quota to the enormous production going on at present. The conservative element in the trade look at the situation with considerable uneasiness, and say that the advance has been too rapid, and, if carried much higher, must react. It is no secret that foreign iron, which, for years past, has been neglected, is now an important element in the trade, and, should manufacturers run the price of the manufactured article up to too high a figure, this competition will assume a graver aspect than it wears at present.—*Iron Age, Aug.* 28.

RAILS.

The rail market continues active and mills are almost daily refusing orders. Sales of 9,000 tons of English iron rails, at about $41, laid down in New York for August, September, and October shipments by steam, are reported. American rails are quoted at $41 to $42 in New York. There is a rumor that 10,000 tons of steel rails for next year's delivery have been sold at $50. It is difficult to name prices at which steel rails could be purchased. Orders for light rails for narrow gauge roads cannot be filled for some months. Old rails are quoted at about $26.—*Railway Age, Aug.* 21.

DRY GOODS.

The wholesale dry goods dealers say that the purchases this season have been of the better class of goods. Formerly, for several years, the Western buyers only dealt in such goods as were actually needed, and generally known under the name of "staple." This year goods of a better quality have been purchased, and even fancy articles have not been disregarded. From the sales already effected, and from the orders received, there is every indication of a first-class Fall trade.—*U. S. Economist and Dry Goods Reporter, Aug.* 23.

HARDWARE.

Business continues in the active condition so frequently noticed of late, and the tone of the market for nearly all classes of goods in the line of general hardware, both domestic and foreign, is strong, with, in some lines, a decidedly upward tendency.—*Iron Age, Aug.* 28.

LEATHER.

The activity and animation in the leather market during the past four months have brought the producers to their senses. Although there has been a perceptible advance in prices, coupled with an unusual demand, it is now realized and admitted that prices are lower than they ought to be. The advance that has been obtained, if we except union crop leather, will not cover the cost. The advance, however, is quite an achievement, after making sales for several years at a loss. The general prosperity of the country is assured, the demand for boots and shoes is already very large, and is on the increase—and why the material should be furnished by the tanners and curriers without a reasonable profit is a conundrum which they propose to answer by announcing that prices are certain to appreciate gradually, but surely, as the season advances, until the cost and a reasonable profit is obtained.—*Shoe and Leather Reporter, Aug.* 21.

PAPER.

The prospects of an active fall season, now about commencing, continue to look very promising. In writing papers, although the month of August is usually a dull one, some dealers complain that the volume of business so far in the month is below the average for this period of the year. Book papers are doing better, as the publishers are beginning to get actively at work again, and the demand is increasing. The call is mainly for the medium and lower qualities. We hear of some of the Eastern mills having orders enough ahead for three months' steady running, at prices which are not very satisfactory to most of them. In news there is no great variation. The supply is at almost all times very large, with competition very strong, and, as a natural consequence, there is much cutting in quotations, and orders are taken at ruinously low rates in very many instances. The export trade continues to be limited.—*Paper Trade Journal, Aug.* 23.

BOOTS AND SHOES.

That the general trade in boots and shoes is still active is evidenced by the shipments going forward to their destination weekly to all sections of the country. The goods sent out for the past week amounted to 61,149 cases, making a total since Jan. 1, or for 34 weeks, of 1,178,261 cases, 86,654 cases in excess of any shipments ever made in the corresponding time. When it is considered that these enormous shipments embrace only the goods that have passed through Boston, and do not include the many thousands of cases that go direct from the factories by being picked up along the railroad routes, at such places as Spencer, Worcester, Ashland, Brookfield, Brockton, Milford, Holliston, Hopkinton, and the numerous towns where boots and shoes are made, some idea of the magnitude of this industry may be formed.—*Shoe and Leather Reporter, Aug.* 21.

FURNITURE.

The amount of business transacted at New York so far this month has not been large, but sufficient has been done to indicate that the Fall trade has actually opened, and gives promise of a larger demand for a good class of furniture. With a demand for a better class of furniture will come an advance in price, and that this is indicated may be inferred from the agitation in this direction now working in the upholstery and carpet trades.

The Upholstery trade is in excellent condition, and business has started off in a very commendable manner. — *Furniture Trade Journal, Aug.* 15.

CARPETS.

For six months the supply has been inadequate to the demand. Few manufacturers, if any, are filling orders promptly; old looms have been called into force, and the new ones are running on full time. The result of this, it is thought by some, may be an overproduction.

During the past month some anxiety has been manifested for the approaching season. Manufacturers fear they will be unable to meet the demand anticipated, and the rise in prices, which, when made, was, by many, not considered politic, has proved to have been a most expedient move. Sales for the month past have been nearly entirely made at prices current on day of delivery. The terms were forced into acceptance, as it is gradually recognized among makers that self-preservation is the first law of nature, and that to protect themselves they must run even with the raw market.

The large buyers, as we predicted, are now paying 5 and 10 per cent. more than on their early purchases.—*Carpet Trade Review, August.*

GROCERIES AND PROVISIONS.

Fault finding at the condition of trade is a thing of the past. A cheerful, almost jubilant feeling exists amongst business men. Manufacturing is brisk, the movement of merchandise lively, the export trade good, crops are fine, and everybody feels confident of a very active movement this fall.—*Am. Grocer, Aug.* 21.

SILK.

Although our importations of foreign silk goods amount to 55 per cent. of the consumption, there has been a ready sale of our home productions, due not merely to low prices, but to elegance and variety of pattern, excellence of work, quality, appearance, shape and style; and with the coming popularity of silk, and the provision that has been made in new and enlarged mills to increase the turn out, the advance in price, though reducing profit, will afford returns sufficient to encourage enterprise, particularly in those fancy fabrics to which our manufacturers have devoted themselves.

The new machinery and improved methods of operating, allowing of more rapid rate of production and giving improved finish, will go far to compensate for any advance in raw material. In silk, above all other goods, the percentage in the cost of the raw material, in reference to the price realized, is the least. This country takes 55 per cent. of its total consumption of silk goods from abroad, but with increased variety and quantity in our own goods—this proportion is not unlikely to be reduced.—*Manufacturers' Review and Industrial Record, August.*

DRUGS.

The activity in the drug market, noted in our last issue, continued through the first part of July, and a fair business was done throughout the balance of the month; prices generally have been fully maintained.—*Druggists Circular, August.*

So great was the shock at the explosion of the boiler of the locomotive Sacramento in Albany, the other day, that every part of the iron down to the bolts and nut was damaged, and not a single piece can be used again.

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NEW YORK, SEPT. 13, 1879.

CONTENTS.

	PAGE.
Hoe's Patent Web Perfecting Newspaper Printing Machine (with Folding Attachment)	1
Novel Punching and Shearing Machines	2
The Future of the Machinists in America. Herman T. C. Kraus	3
Milling Attachment for Lathes	4
Extracts from Chordal's Letters	4
Engine Proportion and Construction—Valve Motions for Quick Speed. W. H. Hoffman	5
Improved Sectional Metallic Packing	5
American Cutlery in England	5
Labor Strikes	5
Steam Boiler Tube Cleaner	6
Prevention of Injury from Machinery. Prof. J. E. Sweet	6
Another Triumph of Yankee Genius	6
New Balanced Slide Valves	6
Condition of Industries	7
Special	8
Co-Operative Manufactories	8
Revival of the Apprentice System	9
Letters from Machinists	9
Literary Notes	9
Questions and Answers	9
Manufactures	10
Machinists' and Engineers' Supplies	10

The price of refined bar iron from store in this city, which began the summer at two cents a pound, begins the autumn at two and-a-half cents a pound, being 25% advance.

Special.

We wish to make the following facts fully understood by our readers:

1st. That nobody has ever paid the publishers of the AMERICAN MACHINIST one cent for anything inserted in its reading columns, either for illustrated descriptions of machinery and tools, contributed articles, editorials, manufacturing notes, book reviews or reviews of shop supplies.

2d. That we never will publish any notice for pay, either direct or indirect, except in our advertising columns.

3d. That no party interested in making or selling machinery, engines and boilers, or in their manipulation has, or ever has had any pecuniary interest in the AMERICAN MACHINIST.

Co-Operative Manufactories.

The great industrial problem now disturbing the material progress of both Europe and America is the labor question. The most puzzling part of this problem is to provide means to employ those thrown out of employment, but happily the rising tide of recuperative business on this side of the Atlantic is sweeping the ranks of ambitious idlers into productive enterprises with a rapidity that gives gratifying assurances for the future. But, with the rising tide of business, one serious difficulty is augmented. Strikes of workmen are becoming more and more frequent, and those averse to contention are made to suffer as well as the prime movers of every disturbance. True, we have not reached that degree of chronic labor upheavals that cause such disasters to productive industries in England, but there is reason for just apprehensions on account of increasing strikes and efforts to regulate rates of wages by wholesale.

Both public speakers and the daily press may urge upon workmen the folly of strikes and discontentment, but their advice generally has but little effect. The reason of this may be that abundance of advice is directed to the workmen specifying what they *should not do*, and but very little of a practical kind pointing out what they *should do* for their own material advancement. The oft-repeated advice of Horace Greeley, "Go West, young man, go West," has in it more practical value, and convincing common sense, than a score of the lengthy lucubrations of polished writers and speakers, who are unceasingly holding up to public view the errors of workingmen, and calling for their reform. It was a well urged maxim of Horace Greeley that workmen should always aim to become their own employers as soon as their circumstances will allow. As very few mechanics can save enough from their regular wages to pay for the machinery and fixtures required to found a manufacturing establishment, some kind of union must be effected among a considerable number of them to carry out any effective plan of self-employment, where the business renders it necessary to have a valuable equipment. Both in Europe and America, co-operative industries have been successful—some of them remarkably so. We have co operative stove foundries in several places in New York and Pennsylvania, that have been in successful operation a number of years. Then there are co-operative cutlery works, leather manufactories, furniture manufactories, and other productive branches doing a prosperous business and dividing the profits among the operatives, each of whom is one of the proprietors.

The largest furniture factory in St. Louis is a co-operative concern, and each of the 110 skilled workmen owns at least one share, and from that to twenty shares of the stock, each share being $25. No one is allowed to hold more than twenty shares. When the concern started only 10 per cent. of the whole capital was paid in, credit being obtained for about $20,000 worth of wood-working machinery. The dividends have always been sufficient to meet all assessments as they became due and to show a satisfactory profit in the business. The men receive ordinary wages for their work, and, as each is a joint owner of the whole concern, put forth their best efforts to turn out as much work, and of as good a quality as it is possible to do. The management is vested in a committee, and no serious dispute in the conduct of its affairs has thus far arisen. Experience having demonstrated the fact that both wood and iron working manufactories can be made to flourish on the co operative plan, each stockholder requiring to possess not over $25 capital to start with (perhaps not over $10) we suggest that able-bodied, skillful mechanics, who feel assured they are not receiving an adequate return for their labor, make a move towards organizing co-operative manufactories. If none but industrious, skillful and progressive mechanics unite in such an organization the business is likely to succeed. Instead of forming societies to insist upon uniform rates of wages, mechanics would adopt a wiser course in starting their own business, thereby securing the full profits of their labor. It is necessary to be assured at the outset that there is a steady demand for the kind of goods it is proposed to make, and that the most desirable improvements are possessed. We commend the co-operative plan to machinists and other artisans who are anxious to employ themselves.

We can not dismiss this subject without quoting from an official report of the United States Consul-General, at Frankfort-on-the-main, Germany, on co-operative societies in that country.

It is a notable fact that, notwithstanding the decline of labor prices, their present cheapness, the discharges of factory operatives, the advance in the cost of living, and the perpetual agitation of the socialists, there have been neither recently nor for many years past any serious labor strikes or troubles. Labor, with all its hardships, and they are many, appears to be complacent, contented, and even prosperous. There must be some potent cause for this, and a careful consideration of the subject leads me to the conclusion that the great system of co-operation, which had its origin in Germany about eighteen years ago, and has had its principal growth within the last ten years, is the chief resolvent of this labor problem. It would be impossible to give an adequate review of this system within the compass of this report. That task must be reserved for future occasions affording better adaptations of time and space. A few salient features only may now be mentioned.

The founder, chief organizer, and present head of the system is Dr. Schulze-Delitzsch, an eminent member of the Prussian Parliament. It arose from no pressure of social disturbances or political agitations, but began and grew from a careful and systematic study of economical principles. It is a system of self-help, as distinguished from State help on the one hand and communal absolutism on the other. It was therefore opposed alike by the bureaucratic and the socialistic elements; the first jealous of all freedom of association, and the latter of all social organization stopping short of political dominion. The first of these forces soon relaxed its opposition, however, for it was directly seen that nothing could more effectually preserve the equilibrium of labor-capital and money-capital, and so set social agitators at defiance, than the organic growth of the self-helping principle.

The leading purpose of the system is that of affording labor direct access to capital by converting labor into a basis of credit. It proceeds from the idea that credit may be created by association; that while an individual artisan cannot borrow the necessary capital to make himself an independent producer, an association of artisans can do so, and that such an association, converting itself in turn into a lender, may obtain the minimum of risk and maximum of security in its transactions, by confining its loans to its own members."

* * * * * *

The first association of this kind established in Germany was organized in 1851. The statutes of its organization were substantially as follows:

1. That all self-helping, industrious persons in regular employment may be eligible to membership.

2. Capital to be acquired by subscriptions of members and by loans.

3. Business to be kept strictly within advances to members.

4. Capital stock owned by the association never to be less than 10 per cent. of the borrowed stock, and to be raised as soon as practicable to 50 per cent.

5. A reserve fund of 6 per cent. of the owned capital and 10 per cent. of the borrowed to be maintained by a contribution of 20 to 25 per cent. of net profits.

6. Shares to be of equal amounts, proportionate to the number of members, and each member to have one share only.

7. Gains and losses to be distributed in proportion to money paid in.

8. Loans to be made mainly on personal security of members, but mortgage may be taken.

9. Rate of interest to be uniform for all, and to depend on state of the money market.

10. Management to be representative, and subject to control of the members in their general meetings. The managing body is a standing committee, or executive council, responsible to the general meeting; in the larger associations, the management is vested in the unlimitedly liable directors, who choose a board of control.

On these foundations, with such improvements as time and experience have developed, multitudes of credit societies have sprung into existence in all parts of the empire, affording the German laborer a practical school of business, a safe deposit, and profitable investment for his earnings, a wholesome and contenting incentive to toil, and the ability to borrow money on equal terms with the millionaire.

It must not be supposed, however, that the credit societies constitute the whole of the German co-operative system. They are the peculiarly German part of the system, but it also includes raw material and store unions, productive associations, or unions for the production and sale of finished wares, building unions, consumption unions, or associations for the purchase and sale of the necessaries of life, and others, whose recent origin indicates the movement of the co-operative principle into new fields.

We publish on another page several interesting reports, copied from the representative journals of different trades and occupations. As these publications are devoted to collecting and disseminating information in special branches of business, their utterances upon the state of trade in these industries may be regarded as trustworthy. It will be noticed that they present concurrent evidences of improving trade and advancing prices. To these we have to add that, according to our own observations, the machinery and tool industry of this country was never in a better or more promising condition. For the most valuable machines and tools, with the most important improvements, all countries of the world are now looking to the United States, and our enterprising mechanics have a brilliant future before them.

That venerable philanthropist, Peter Cooper, intends to enlarge Cooper Institute by the addition of another story. There has been a growing demand for more room, the number of students being constantly on the increase. The plans for the change have been placed in Mr. Cooper's hands, and will soon be agreed upon. The walls of an ornamental attic story are to be carried up to a height of twenty feet. A heavy metal cornice will finish off the story, and the structure will be surmounted by a dome.

We would direct special attention to an article by Prof. John E. Sweet, on page 6, calling attention to the frequency of accidents from buzz saws, and explaining a device of his own for preventing the greater part of such accidents. There is no doubt that gross carelessness causes a large proportion of machinery accidents, but often a few dollars expenditure by a shop-owner may save many from the loss of life or limb, and it is well for them to give this matter careful consideration. Inquiry will show that most of the deadly disasters generally befall those well acquainted with the manipulation of machinery. Prof. Sweet has calculated that about 5,000 persons get torn by buzz saws every year. It would be interesting to know how many meet with distressing accidents from being caught up by belts, falling with elevators, and being hit with pieces of bursting grindstones and emery wheels. Does any one doubt that most of these accidents could be prevented by seasonable precautions, such, for instance, as the safety device for buzz saws explained by Prof. Sweet? It is worth some time and expense to provide suitable safeguards in both wood and iron working shops, but it is not usually so regarded. Dust, either from grinding wheels or wood cutting, can be carried away from workshops

as fast as made by appliances now in extensive use. A few years ago, the workmen in a planing mill had an unpleasant situation, but with the modern "conductory," all the dust and shavings pass away directly to the boiler furnace without fouling the air of the room where the work is going on.

Revival of the Apprentice System.

To the thoughtful mind, few topics are of greater moment than the canvass of feasible ways and means toward the elevation of the wages-workers of the world to the position that nature meant them to occupy, when she created them capable of free thought and motion. That so many are bound down by poverty to poorly-paid tasks, which admit of neither, is a fact too saddening to be stated flippantly, and too important to be ignored. Nature meant that it should be otherwise, but the pressure of circumstances, aided by their legitimate fruits, viz., poverty, ignorance and inertia, has fastened a hopeless lot upon millions, until they have apparently lost the ability to think or the energy needed to put their thoughts into execution.

Yet even men in middle life, who are burdened with family ties, as infirm parents or helpless children, can, if they will, do much toward helping not only themselves, but their comrades out of this slough, whose greatest evil lies in the fact that it is so often a slough of despond. But the point at which wisely-directed effort can soonest hope for favorable returns, is in the direction of helping the young to gain a fair and square start in the race of life.

So far as it goes, what better means could be devised than a return to the old-time apprentice system, modified to suit the altered conditions of our day? All must admit that the beginner in any trade, business or profession, whether workman, merchant or attorney, must learn thoroughly all parts of the branch that he intends to pursue, if he hopes ever to succeed in it. But, at the present day, what inducement has any manufacturer to teach beginners anything above the level of machine feeding, unless under some reasonable guaranty that he will retain the beginner's services for a length of time, during a portion of which his trouble and loss of time will be repaid by reasonably-skilled labor at apprentice rates of pay?

Next to a wise choice of the trade or avocation that a boy is best fitted for, the question of *permanence* in it for a term of years, long enough to be alike useful to the learner and fair to the employer, without yielding to the boyish love of change or the unthrifty sacrifice of future opportunities for a small present gain, comes to the front as a long step toward the solution of this important problem. But parents, or guardians, or friends, as the case may be, must take steps in advance to secure proper tuition and systematic change of tasks. While, to the apt learner, a moderate course of machine feeding even may convey a valuable lesson, month in and month out, or year in and year out, spent in such tasks, tend alike to promote discontent in the present and to stunt growth for the future.

As to the length of this apprenticeship, it should, in no case, be less than three or more than five years; nor should it begin earlier than the age of sixteen years, for important reasons.

If too short a time is insisted upon, the learner's education will be incomplete, and, unless from motives of philanthropic kindness, the employer will not, in many instances, feel called upon to make it complete. If too long a term is chosen, either the learner's preliminary education in the common schools will be neglected to his life-long disadvantage, or his course of apprenticeship will be, in many cases, cut short by his attaining the age of twenty-one, which, in this country especially, marks the boundary line at which boyhood and its drawbacks and conditions leave off, and manhood with all its responsibilities begins. As a general rule, the age of sixteen or seventeen should be the point of beginning, and four or five years the term of this apprenticed probation. In a trade as complicated and full of suggestion as that which the apprentice learns in the machine shop, perhaps four years would be the more desirable limit.

In no trade or avocation is there a better field for inaugurating and perfecting an innovation of this kind than in the various branches connected with the machinery interest, for the reason that no field offers so many opportunities for the profitable employment of skilled labor as this, to which all branches of manufacture and trade must of necessity pay tribute, in return for its various contributions to their systems and processes.

LITERARY NOTES.

STATE OF LABOR IN EUROPE. Reports from the United States Consuls in the several countries of Europe on the Rates of Wages; Cost of Living to the Laborers; Past and Present Rates; Present Condition of Trade; Business Habits and Systems; Amount of Paper Money in Circulation, and its Relative Value to Gold and Silver for the several Consular Districts, in response to a Circular from the Department of State, Requesting Information upon these Subjects; together with a Letter from the Secretary of State Transmitting these Reports to the Speaker of the House of Representatives.

Our thanks are due to Hon. Wm. M. Evarts, Secretary of State, for a copy of the above work, a 428-page volume. It is even more comprehensive than the title indicates, as it includes consular reports from Canada, and, in the Appendix, reports from Australia, China, Egypt, and the Argentine Republic. The gathering and publishing of correct labor statistics is a work of great importance and value to the productive interests of our country. While internal labor statistics are not wanting, we have never before seen a collection of reliable foreign statistics of this kind presented in a plain, practical manner so as to convey desirable business information. The Secretary's letter covers 39 pages, and treats the subject in all its bearings. We are strongly opposed to the conclusion arrived at by Mr. Evarts, that American workmen must accept a reduction of their wages to the level of European workmen, in order to secure foreign markets for our manufactures. In his own language: "We have no oppressed and stupid peasantry little more intelligent than the tools they handle. All are self-thinking, self-acting, and self-supporting." This being the case, they will not become convinced by the Secretary's arguments as to an equalization of wages with foreign workmen. Near the close of his letter he says: "Let our workingmen read these reports and compare the fixed condition of the European labor populations, as graphically portrayed by our consuls, with the free and independent position of our American workingmen, not as special depression has made them at present, but as they have been and as they will be again.

"The workingman of Europe is born to labor through life; in labor must he continue to the end. There, indeed, are capital and labor severely and eternally divided, unless when some great upheaval in its madness pulls all things down to a common level. But in the United States the workingman of to-day may be the capitalist of to-morrow. Labor and capital are only divided by intelligence, industry and pluck, and all honest, steady, sensible laborers work to become capitalists."

Our consuls, under Mr. Evart's direction, have become of more real value to the country than they ever have been before. In response to a circular issued by the State Department in 1877, they made some very interesting reports upon the demand for manufactured goods, such as produced in America, in the several countries to which they are accredited. These labor reports are prepared and issued in furtherance of Secretary Evarts' policy of making the Consular System an aid to the extension of American commerce. His efforts in this direction have materially contributed to rapidly enlarge our export trade by furnishing the information our manufacturers desire, and should receive the highest commendations from all enterprising business men and active mechanics.

The American Manufacturer and Exporter is a new monthly trade journal published in Boston, mainly in the grocery interest. It contains 36 pages, quarto form, and has an illuminated and varnished cover. E. R. Taylor is agent for New York and vicinity.

In our issue of August 9th, in reviewing the Universal Assistant and Complete Mechanic, we inadvertently omitted to state that the address of Mr. R. Moore, the publisher, is No. 20 Cooper Institute, New York. This neglect has given us occasion to answer several inquiries from parties who wish to purchase the book.

Letters from Machinists.

We are receiving so many complimentary letters from our readers that it would be impossible to print them all. Some of them contain valuable suggestions. We print two of them below:

NEW HAVEN, CONN., Aug. 23.

Mr. Editor:

I take much pleasure in reading the articles by L. F. Lyne, M. E., and hope he will continue them until the tool grabbers, as I call them, give up these slovenly practices. I always notice such men invariably leave any tool they have been using just where they happen to drop it. Where I am now working I noticed one man, just after turning a pulley, take out his arbor and throw it on the floor between his lathe and the bench. Out of a dozen men in the shop every one passing that way walked over that arbor for fully a week before it was picked up. Such men always want to know where to find this drill and that tap and wrench. They never return any tool they borrow. Many is the time I made up my mind not to lend tools to such men, but when they asked again I could not refuse. I hope these men will read Mr. Lyne's articles and profit thereby. I hope he will stir up the men who never think of oiling any tool they may be working upon until it grinds so they cannot avoid oiling it.

Yours, B. M.

CENTRAL FALLS, R. I.

Editor American Machinist:

SIR: I have read your valuable paper for some months, and am very much pleased with the practical manner in which you present your subject to your readers. There is *one* that I have been hoping you would touch upon that would be of great interest to one class—pattern-makers—of your readers, if not to all. I refer to gearing. We get cords of its theory in Appleton's Cyclopedia of Mechanics; now, if you would devote a page or two to the practical part you would, no doubt, oblige many of your readers.

Do not have some professor, or C. E., or M. E. write a treatise, but if you can find a man who has a reputation for making a pattern for a good running gear, who is willing to let others know how he does it, let us hear from him. If he is not able to write an article, I suppose you could find some one that could do that part of it. Let us know how he proportions his teeth, what clearance he allows, and how he gets the curves for the faces of spur and bevel gears, and oblige,

Yours truly,

JOHN UTTER.

Business Specials.

Thirty cents a line for each insertion under this head.

The Huntoon Steam Governor Co., of Lawrence, Mass., warrant a direct saving in steam of from 10 to 20 per cent. over any other Governor known; while for quick and accurate regulation, great durability and lasting economy in use, they guarantee results never before attained by any other. See advertisement.

Brown & Sharpe M'f'g Co., Providence, R. I., keep in stock at reduced prices Patent Cutters for the teeth of gears which can be sharpened by grinding without changing their form. All wheels of same pitch cut with them will run together correctly. Send for new catalogue.

National Steam Pump, simple, reliable and durable. Send for illustrated catalogue with reduced price list. W. E. Kelly, New Brunswick, N. J.

Questions and Answers.

Under this head we propose to answer questions sent us, pertaining to our specialty, correctly and according to common sense methods.

(1.) L. O., Sedalia, Mo., writes: 1. What is the correct way to get driving boxes, on old locomotives, square, with shoes in front and wedge in back side of pedestal jaw? I wish to square them both ways, both horizontal and perpendicular. 2. How to go about hanging new cylinders to old locomotive boilers and get them correct and square? 3. Also what is the best material to use in grinding brass and brass for steam joints, also brass and iron for the same purpose? Will you please give the desired information to the above, and oblige, not only one machinist, but many. A. We have had inquiries in reference to questions 1 and 2 before, and to answer them fully would be impossible in the columns of Questions and Answers, therefore we expect to publish an article soon on each of these subjects. 3. The faces of the joints should be scraped down, so all that is necessary for the grinding material is to smooth the surface. The best material that we have ever used for ordinary work, where two surfaces of brass are used, is quartz, or as some call it, ground glass. Will also answer for iron wet with water, no oil. If a very fine surface is required on very hard substances, use Arkansas oil stone powder. We do not approve of much grinding on joints, as better work can be done in the manner above described.

(2) C. H. B., Connersville, Ind., writes: Being a constant reader of your most valuable paper, and a young engineer as well, will ask a few questions: 1. What kind of a furnace will be best to burn saw-dust and shavings, and how to construct and build the boiler? I propose one 42 in. diameter, 18 ft. long, with 4 flues, two of which are to be 10 in. in diameter and the other two 8 in. in diameter. 2. What is the definition of the diagram of a steam cylinder, and in reference to the pressure on the piston, does th curved line represent the steam? Please explain. 3. What is the difference between an automatic cut-off and slide valve? What is a fixed cut-off? 4. Can a common slide valve engine be made to cut off at any point in the cylinder? If so, how is it done? Not being educated, I write for information. A. 1. The same size furnace that is used for coal will answer, but the grate bars should be broad and perforated with small round holes. The furnace doors should be larger and on a level with the floor, and the ash-pit covered with iron plates so that the shavings and saw-dust may be shoved into the furnace with a sort of scraper, instead of a shovel. There should be a damper between the boiler and chimney in order to control the furnace. Where shavings are used for fuel, economy is generally speaking, of little consequence, hence the common cylinder boiler with no flues or tubes is used and requires very little attention, moreover this pattern of boiler is used because more shavings and refuse material can be burned under it, than any other. The construction of the boiler for the purpose mentioned, therefore, is generally determined by the circumstances, which are various, and if you will mention any particular one, we will advise you. 2. The indicator diagram was fully defined in "Engineering Explanations," contained in our issue of Aug. 2, 1879. 3. An automatic cut-off is one in which the governor, instead of being connected to a valve in the steam passage, and thus controlling the speed of the engine, is by means of suitable mechanism connected directly to the motion of the slide or steam valve, thus by the variations of the balls of the governor the valve is made to cut off more or less so that the same speed may be maintained. A fixed cut-off is one in which an independent or extra eccentric is used, also an extra valve. The eccentric is set permanently on the shaft so as to cut off at the point determined upon, and will continue to do so unchanged, *i. e.*, the cut-off will take place at the same point in the stroke, until it is thought necessary to change it. 4. Yes. Move the piston to the point where you wish the valve to cut-off, then roll the eccentric (in the same direction that the engine is intended to run) until the port is just closed. Tighten the eccentric and try it on both strokes to see that the valve is square, then place the crank on the center and if there is more lead, *i. e.*, if the port opens more than is required, more lap must be added to the valve, or if the engine has a rock arm, the one to which the eccentric rod is attached may be lengthened until the difficulty disappears.

(3) C. D. F., St. Johns, N. B., writes: I have engaged in a discussion with different engineers in reference to the difference in economy between the fixed cut-off, or slide valve, and the automatic cut-off. I believe the automatic cut-off to be the most economical, and I await your decision. Am I right? A. In our opinion we believe you are right, for, singular as it may seem, there are engine constructors who have yet to learn that the automatic engine is capable of developing a given power at a reduction of 26 to 75 per cent., as compared with the cost of the power by the rank and file of throttling engines. Under favorable conditions the loss in economy by the slide valve engine, as compared with the cut-off, is nearly 30 per cent., and a comparison of the performance of slide valve and cut-off engines, by test trial, show that 20 per cent. is the minimum saving by automatic cut-off engine. Such tests were made at the Cincinnati Industrial Exposition in 1875, and the results and tables can be readily obtained, and are embodied in a little book known as Hill's Engineers and Steam Users Manual, published by Wm. A. Harris, Providence, R.I.

MANUFACTURES

Geo. R. Cheeseman is making an effort to build a grist mill at Genoa, N. Y.

A large brick building is in process of erection at the corner of Blum Street and Bergenwood Avenue, Jersey City, N. J., which will be used as a silk factory.

Firesteel, Dakota, intends to have a mill soon.

Steel Station, Iowa, will soon have a flouring mill.

Messrs. A. Bertelson & Son are erecting a two-run mill at Elsnore, Sevier Co., Utah.

Mr. H. H. Hyder, of Piney Flats, Tenn., will repair his mill this fall and add some new machinery.

S. T. Cummings, of Oxford, Mich., is building a new flouring mill.

William Wright, Newburgh, N. Y., is now building steam engines for Janeway & Carpenter, New Brunswick, N. J.: Cereal Food Co., Desbrosses Street. (125 H. P.); Hand & Ellsworth, 51 Beekman Street; Ebling's Brewery, 149th Street, and Nicoll, the Tailor, Bowery, New York. Also a compound engine for Stephen Sanford's carpet factory, Amsterdam, N. Y.

The Cereal Food Co. are erecting a new brick factory in Desbrosses Street, New York.

Asbury, N. J., wants water works or a steam fire engine.

Beard & Robinson are building a seven story grain elevator at the Erie Basin Dock, on Van Brunt Street, Brooklyn; architect, Wm. Stoll.

J. W. Masury is building a one story brick varnish factory at Nos. 189 & 191 Plymouth Street, Brooklyn.

E. D. Jones & Co., of Pittsfield, Mass., have contracted to build for Buckley, Duncan & Co., at Middlefield, a new paper mill, to be of brick, with an engine-house 40 by 60 feet, a cutting-room 31 by 41, and a bleach-house 30 by 50, all of two stories.

It is stated that a company has been formed in Pittsburgh to engage in the manufacture of architectural iron at some point—probably Beaver Falls or New Castle.

The Lowell (Mass) Carpet Company are building their own Brussels looms for the new mill.

A new company has been organized called "Cherry Valley Iron Works," which will put into operation at once the works of the late Cherry Valley Iron Company, of Leetonia, O.

Watkins & Keeler, a new firm from Pittsburgh, Pa., will soon erect a large boiler manufactory at Chicago.

The Western Watch Co., at Grand Crossings, Ill., have most all of their light machinery placed, and in all probability will be running in a few days.

The Orrville (O) Crescent says that the new mill building there this summer is 45 x 56 ft., five stories high, and intended for twelve run of burrs.

The American Steam Boiler Works, of Chicago, have recently completed an extensive addition to their manufactory. They now employ 68 hands and will turn out $150,000 worth of work this season.

Attica, N. Y., is to have water works.

Deadwood, Dak., is going to have water works.

The city of Fort Wayne, Ind., on August 5, voted by a majority of 2,544 to erect water works, at an estimated cost of $270,000.

The Councilmen of Iowa City, Ia., have expressed a determination that their city shall have water works, and that in the near future.

Henry & Co., manufacturers of Excelsior, or "Yankee shavings," have decided to enlarge their capacity at an early day, They have purchased a sixty-inch, twelve-tube steel boiler, at a cost of $500.

A. C. Capen is laying the foundation for a shop at West Cummington, Mass. He proposes using an engine for wood-working machinery.

There is a prospect that the capacity of the Bay State Iron Works, Boston, will be soon increased. 350 men are now employed, and orders are coming in faster than they can be filled.

The big steam hammer in the Boston & Albany shops at Springfield, Mass., has been started up on a lot of 800 car axles. This means work for additional hands.

The new brick mill which the Nonotuck Silk Company are to build at Leeds, Mass., will be three stories high, 130 feet long and 40 wide, with an L at both ends.

The work on Tucker & Cook's cotton-warp mill at Conway, Mass., is being pushed, a good part of the foundation being already completed.

The Whittier Machine Company, Boston, are making a specialty of steel boilers. They are now furnishing at their works two 5 x 15 steel boilers for the Wilimantic Linen Company, two 5x15 steel boilers for the Plymouth Woolen Company, and two 5 x 12 steel boilers for W. F. & F. C. Sayles' bleacheries at Pawtucket, R. I. All their boilers will be set on the Jarvis system to utilize the unconsumed gases with hot air, the same as the Siemens principle of making steel.—*Boston Journal of Commerce.*

A company has just been formed in Portland, Me., says the *Commercial Bulletin*, for manufacturing a large variety of articles from wood and other kinds of pulp, by a new, yet thoroughly tested process. The name adopted by this company is the Presumpscott Pulp Package Manufacturing Company, the active members of which are S. C. Andrews, Esq., of Portland, and Mr. Jefferson Chase, of the Chase-Turbine Manufacturing Company of Orange, Mass.

The work of enlarging the manufacturing capacity of the Cutlery Company's factory at Granby, Conn., is about done, and work in the factory will be resumed at once. The business of this company is growing very rapidly.

The Peck, Stow & Wilcox Company of Kensington, Conn., have about fifty moulders now employed, and are making arrangements to increase the number to sixty or more.

Work on Eames Petroleum Iron Works at Titusville, Pa., is progressing rapidly, and it is thought that operations will be commenced in about four weeks. When completed, $25,000 will have been expended on the building and works, and projectors of the industry affirm that they are making no experiment.

A rolling mill at Tamaqua, Schuylkill County, Pa., has been unable to start up owing to a lack of hands.

Another woolen factory is to be added to the mills of Manayunk (Philadelphia) this fall.

A license has been issued to form the McCormick Harvesting Machine Company, of Chicago, with a capital of $2,500,000.

The Taunton (Mass.) Locomotive Works recently delivered 12 engines to the Atchison, Topeka and Santa Fe, and are building 10 more for the Union Pacific.

The largest furnace of the Reading Iron Works, Reading, Pa., which went out of blast four years ago, was blown in Aug. 12. This company is now building a new tube-mill, which, when finished, will give employment to 200 additional hands.

A manufacturing firm is said to be negotiating for the purchase of Jones & Co.'s old car shops at West Troy, N. Y.

A manufacturing company has recently leased Thompson's foundry, at Bordentown, N. J., which has been idle for four years, and will commence operations there on October 1.

A new company, under the firm name of Loring, McNeil & Co., has been organized at Clinton, Mass., to engage in the manufacture of combs, buttons, etc.

A hat factory is talked of at Orwigsburg, Pa.

The Ohio Paper Company, of Miamisburg, has been incorporated. The capital stock is $80,000, in shares of $1,000 each.

It is proposed to form a new chair company at Ashburnham, Mass., to operate the manufactory of George C. Winchester.

A new rolling mill is to be constructed at Beaver Falls, Pa. A site has been selected and the ground is now being staked off ready to begin work.

Tennant, Boyts & Co., of Connellsville, Pa., are erecting a new foundry building. The entire structure will be of brick, 72 by 132 feet, with iron roof and shutters.

John Reardon & Sons, Cambridgeport, Mass., are setting a six-foot steel boiler, built by Kendall & Roberts, with the Jarvis furnace. This is their third order for this setting.

The Co-operative Foundry, Beaver Falls, Pa., is doing a very active business, having just filled an order for 180 stoves and two tons of plates, in addition to two car loads of castings, sent off last week.

The Ohio Bridge and Iron Works, formerly at Lancaster, O., are putting up new shops at Urbana, O.

Geo. West, Balston Spa, N. Y., is setting a tubular boiler with the Jarvis furnace at his new mill. He intends to have one of the finest paper mills in the country.

John McLean, paper manufacturer, Balston Spa, is also setting a boiler with the same furnace.

The Seibert Cylinder Oil Cup Co., through their agent Frank H. Lynch, 34 Vesey St., N. Y., have recently furnished 8 cups to F. B. & H. K. Thurber; 12 to Havemeyer & Elders, N. Y., and 7 to the Ontario Silver Mining Co., Salt Lake City, Utah.

The Greenwoods Co., New Hartford, Conn., are setting two boilers with the Jarvis setting.

S. Park Lathrop, Newark, N. J., is shipping his Victor Patent Adjustable Pipe Wrench to Charles Churchill & Co., London, England. Negotiations are also under way looking to the establishment of a Russian agency for this tool, to be located at Warsaw.

At Wilmington Del., a stock company is about to establish a manufactory capable of making one hundred tons of beet sugar a day.

The George F. Blake Manufacturing Company have recently shipped to the Louisville Water Company, Louisville, Ky., two duplex Blake pumping engines, each of 3,000,000 gallons capacity per twenty-four hours.

A new shoe factory is being built at Newton Junction, New Hampshire.

C. & J. Colvin, Worcester, Mass., have been enlarging their foundry, and have just put in a larger boiler made for them by Messrs. Wm. Allen & Sons, of Worcester.

G. G. Young, 42 Courtlandt Street, New York, has just shipped a 30 h. p. "Economizer" boiler, made by the Porter Manf'g Co., Syracuse, N. Y., to Adelaide, Australia.

The Wheeler & Wilson Company are constructing, in the tool department of their factory at Bridgeport, Conn., an improved machine for cutting out horse shoe nails, which can make about 75,000 nails a day, and will cost over $20.000.

TOOL DEPOT. SMALL TOOLS, LATHES &c FOR MACHINISTS, CARPENTERS AMATEURS & EVERY BRANCH OF MECHANICAL TRADE. SEND FOR CATALOGUE. TALLMAN & McFADDEN, PHILADELPHIA.

Engineers' and Machinists' Supplies.

The market is lively, and prices are tending upwards. The iron merchants of this city held a meeting August 27th, and advanced refined bar iron from 2.3c. a pound to 2.5c. a pound, and the whole iron list proportionately. Shops, mills, and factories that have been idle for years are starting up with a good supply of orders to fill. Morris, Tasker & Co., National Tube Works, and other manufacturers of wrought iron pipe and fittings, have announced a withdrawal of all previous quotations. Orders are filled at prices ruling on day of shipment. The manufacturers of bolts, nuts, and washers are advancing prices so frequently that no definite quotations can be given for orders for future delivery. Boiler rivets have advanced ¼c. a pound within a few days. Malleable gas and steam fittings have advanced 10 % within a few days. Pure rubber has made a long stretch upwards, but how the supplies and fabrics made from it will be affected remains to be seen. Brass and brass goods are likely to advance soon.

We have received from Tallman & McFadden, 607 Market street, Philadelphia, a copy of Supplement to Metal Workers' Catalogue of 1879. It contains forty pages, and exhibits cuts and prices of quite a variety of tools and machinists' supplies; many of the articles illustrated being new to the trade.

Frasse & Co., 62 Chatham street, N. Y., have received and sold a number of a new three-cone-pulley hollow-spindle engine lathe, weighing 500 pounds. It sells at $110 to $125, and bids fair to become quite popular.

The Hancock Inspirator Company, Boston, Mass., are nearly ready to offer a new device for intensifying the fire under a boiler by blowing in a jet of steam.

William Cooke (successor to Cooke & Beggs), No. 6 Cortlandt street, New York, is offering a new device for cleaning out foul boiler tubes by blowing steam through them.

Boxwood and ivory rules have been slightly advanced.

Situation Wanted—Help Wanted.

We will publish notices suitable for the above headings, applying to any of the machinery trades, and not to exceed four lines each (32 words), at the nominal rate of twenty-five cents for each insertion.

WANTED.—A good mechanical draughtsman, accustomed to steam engine and mill work. Call on Wm. Munger, 503 First Avenue, City.

WANTED.—A situation to design machinery. I have first-class talents as an inventor. I am machinist, draughtsman, and have a good technical knowledge. Address, C. C. C., Dorchester, Mass.

USEFUL BOOKS FOR PRACTICAL MEN.
DESCRIPTIVE CATALOGUE FREE.
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Send for new Catalogue, 1879, to
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WELL-AUGER. Ours is guaranteed to be the cheapest and best in the world. Also nothing can beat our SAWING MACHINE. It saws off a 2-foot log in 2 minutes. Pictorial books free. W. GILES, Chicago, Ill.

Milling Attachment
FOR LATHES,
See description in the AMERICAN MACHINIST of Sept. 13, 1879.
MANUFACTURED BY
WM. MAIN, Piermont, Rockland Co., N. Y.

Steam Boiler Tube Cleaners,
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AND
General Machinists' & Engineers' Supplies.
For illustrated article on Steam Tube Cleaner, see current issue.
WM. COOKE, 6 Cortlandt St., New York City.
SEND FOR CATALOGUE.

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Surface File Holders,
Vise File Holders.
Stub Files and Holders.
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Estimates promptly furnished large buyers personally or by mail.

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239 Broadway, N. Y.
83 Water Street, Boston.

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The same principle as the SIEMENS' PROCESS OF MAKING STEEL, *i. e.*, utilizing the waste gases with hot air.
Will burn all kinds of waste fuel without a blast, including screenings, wet peat, wet hops, sawdust, log-wood chips, horse manure, &c.

A. F. UPTON, General Agent.

Also Agent for the Mahony Patent Corrugated Grates, with 50 per cent. air space.
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Machinists' Tools,

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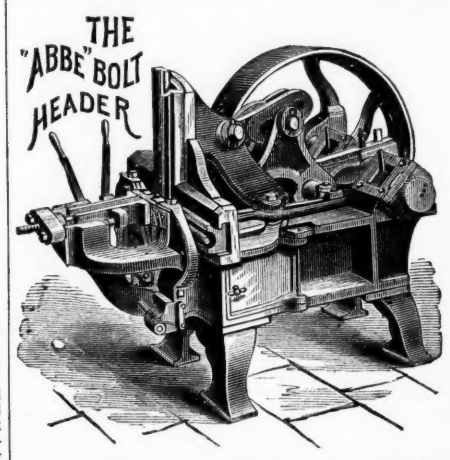

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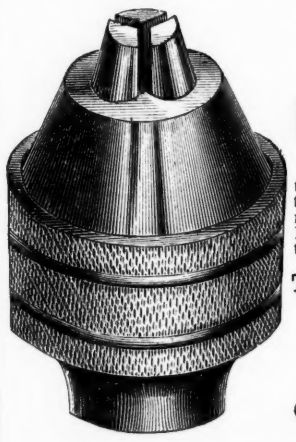

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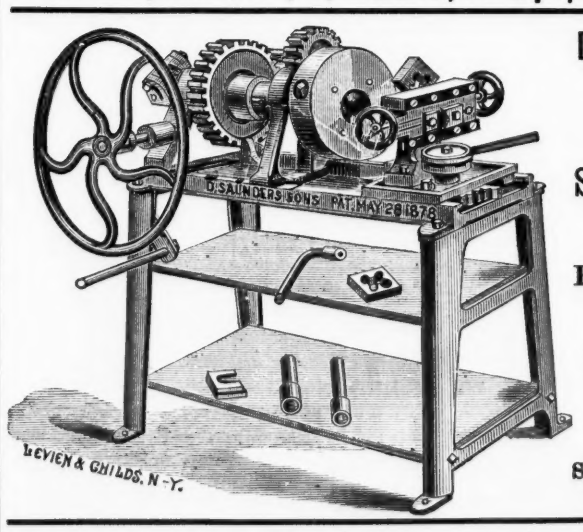

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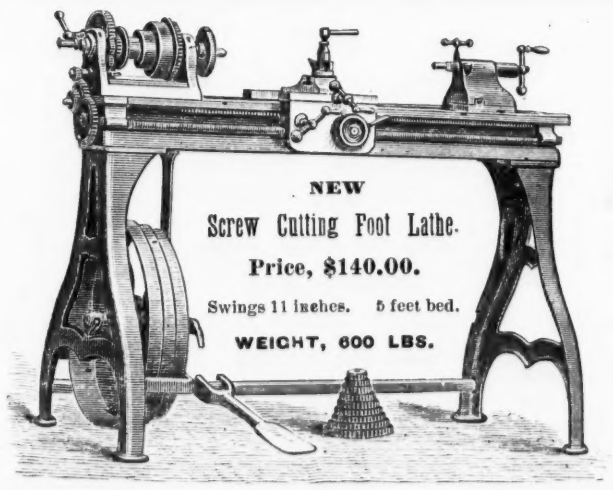

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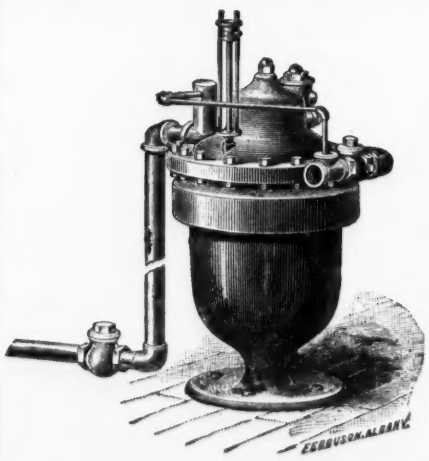

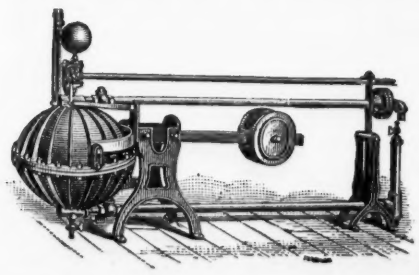

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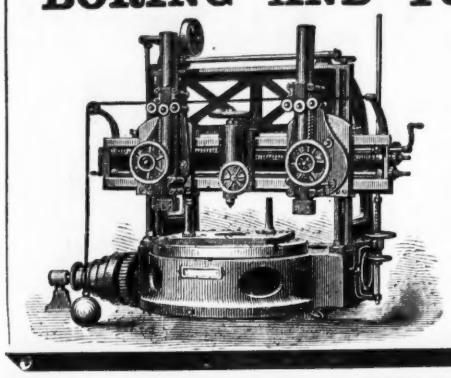

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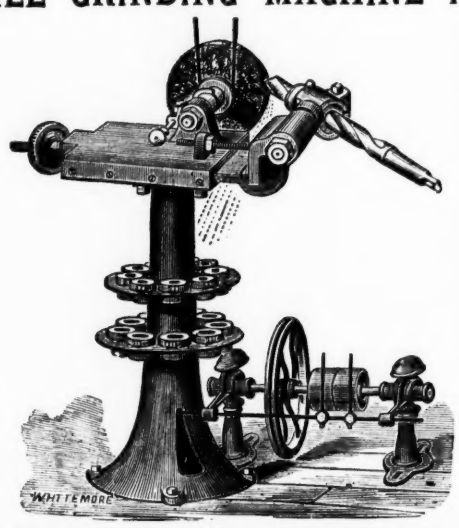

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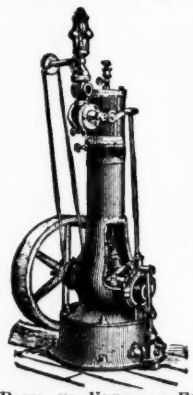

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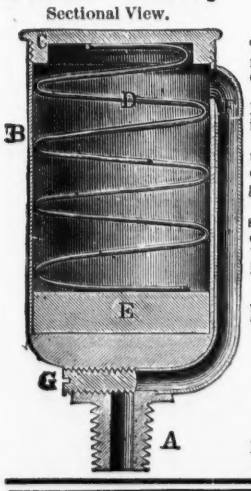

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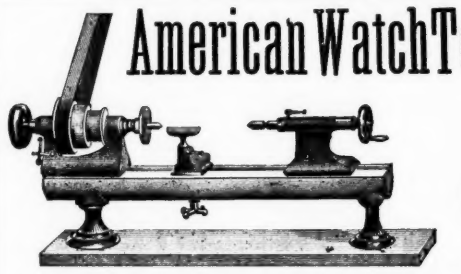

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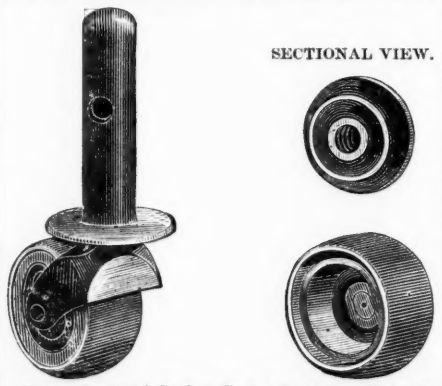

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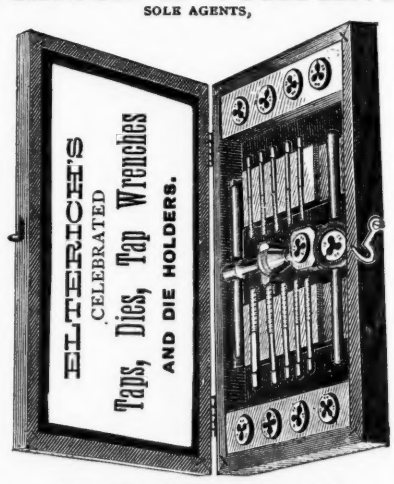

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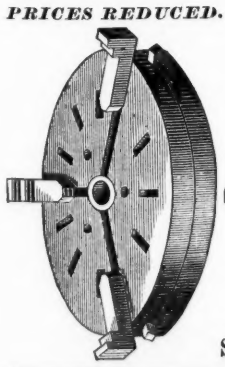

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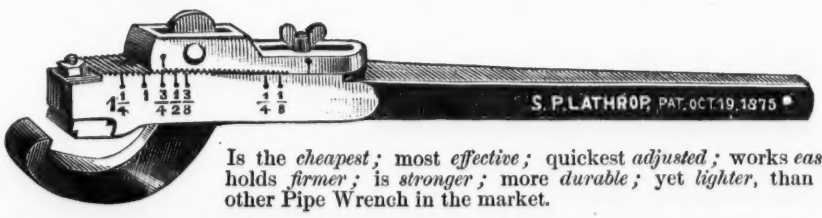

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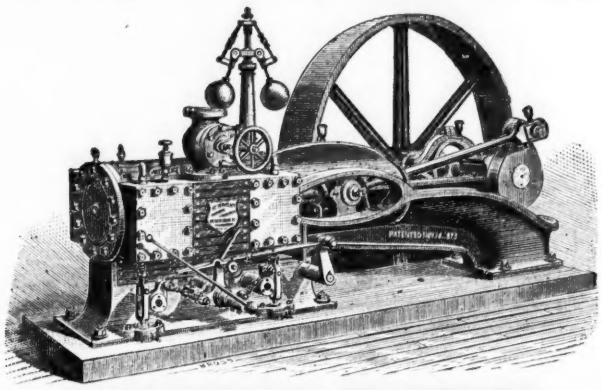

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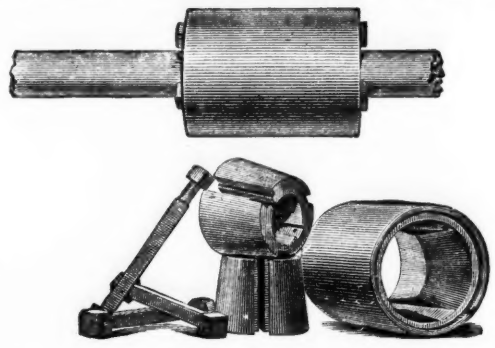

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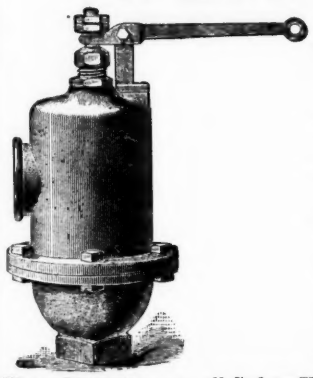

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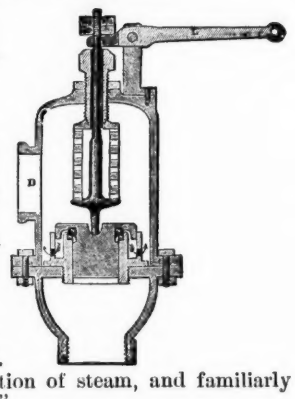

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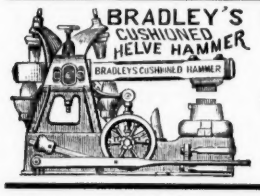

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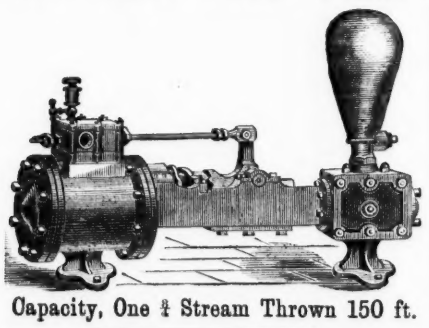

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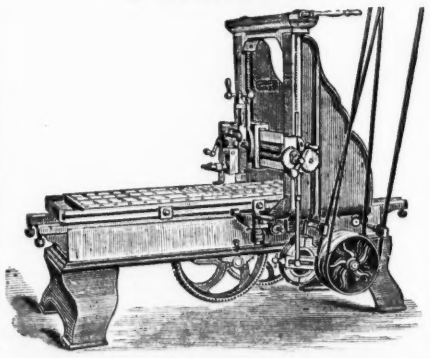

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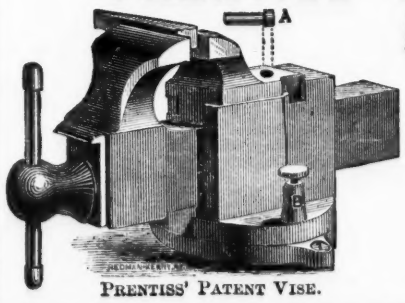

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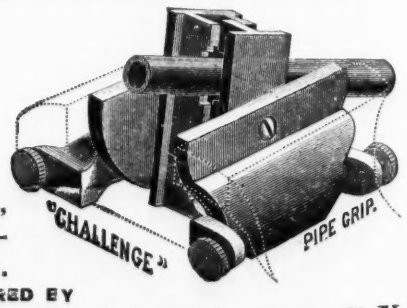

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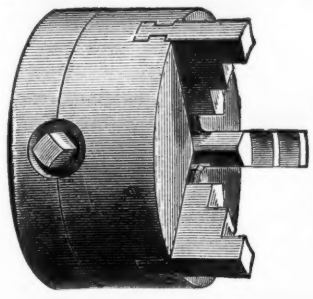

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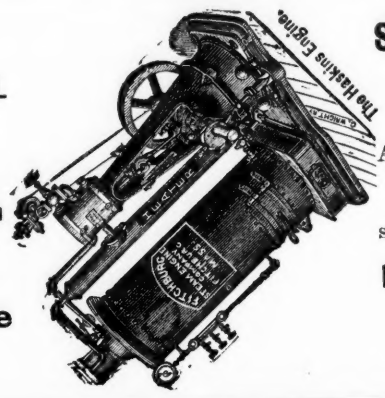

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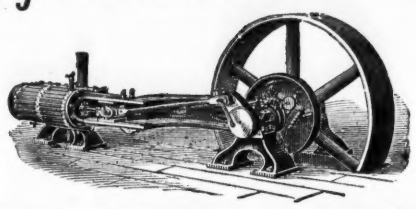

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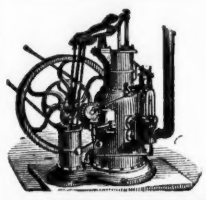

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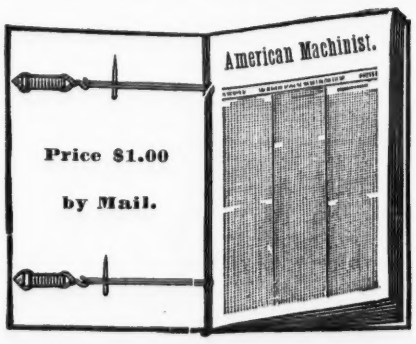

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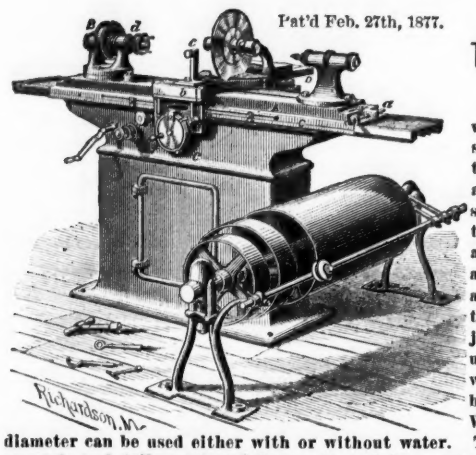

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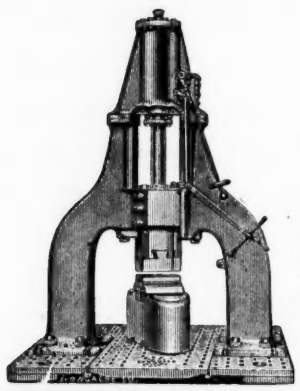

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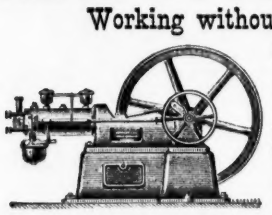

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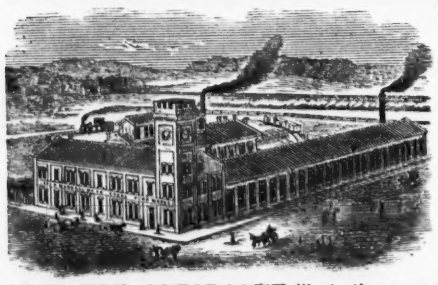

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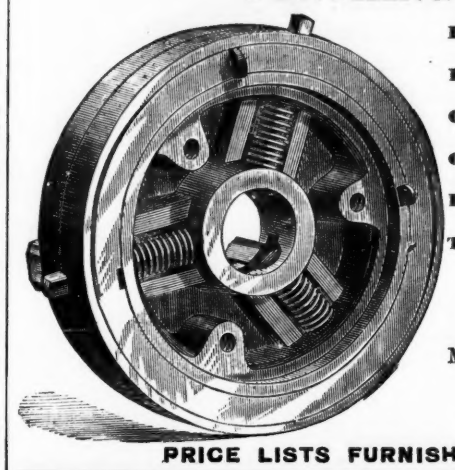

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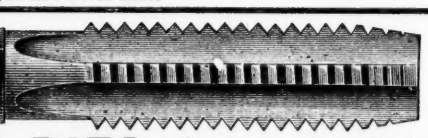

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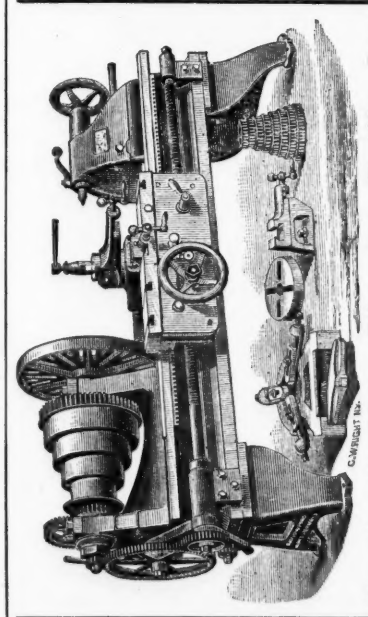

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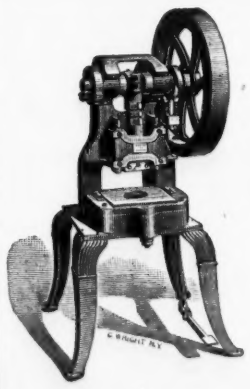
167 to 173 Plymouth St., cor. Jay, Brooklyn, N. Y.



Catalogues in English, French and German sent on application, in which prices are computed in Dollars, Pounds, Francs and Reichsmarks.